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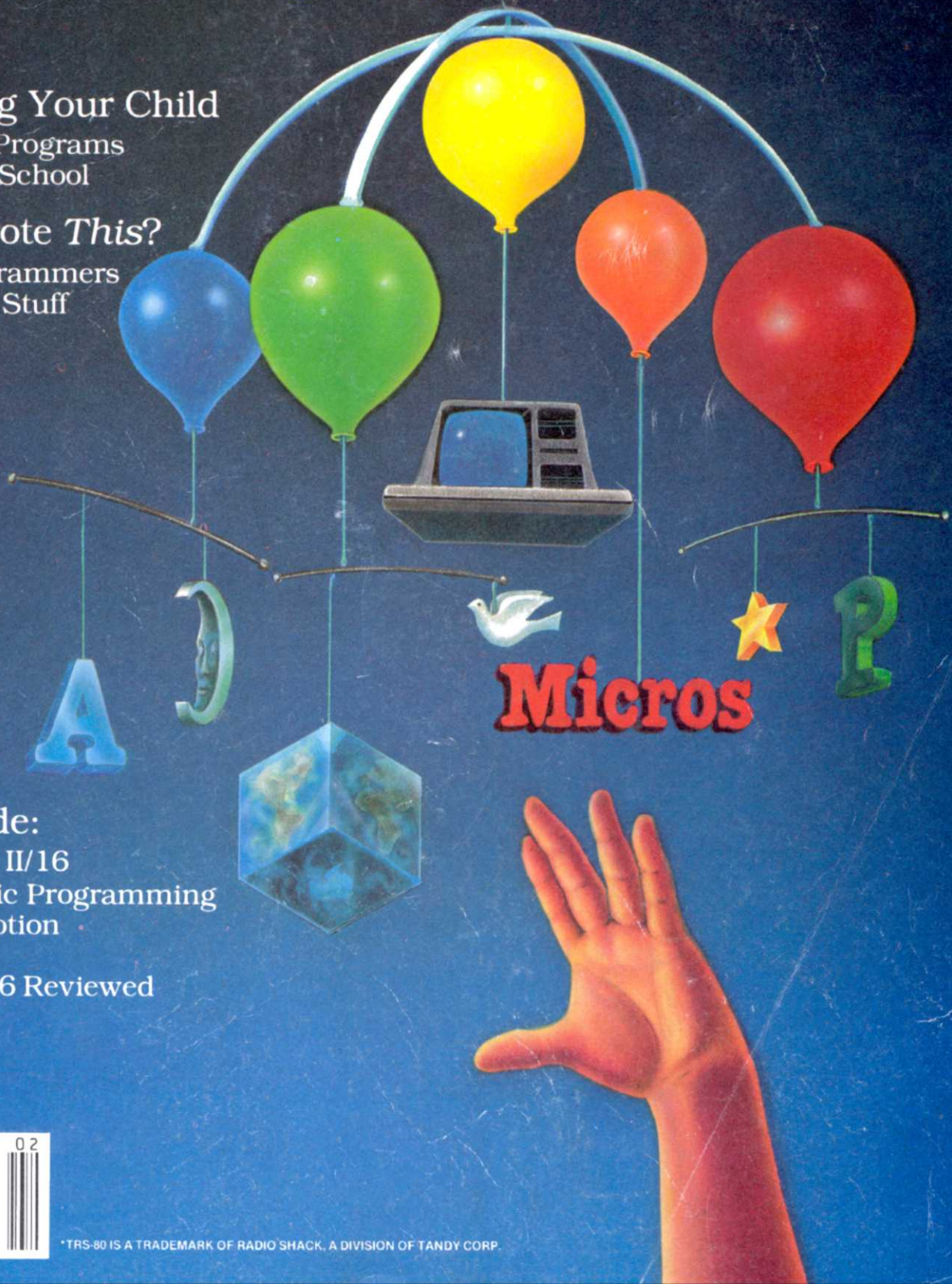
80micro®

A WAYNE GREEN PUBLICATION

the magazine for TRS-80 users*

Micros: The New Supertoys



Educating Your Child
Six Simple Programs
Told Out of School

A Kid Wrote *This*?
Young Programmers
Show Their Stuff

Also Inside:
Inside Your II/16
Beyond Basic Programming
Poetry in Motion
Son of Pilot
The Model 16 Reviewed

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80 Contents

Features

38. The Next Step
A new column on combining Basic and machine language.
Hardin Brothers

40. Suite 16
A new column on the Model II and II/16.
Dan Keen and Dave Dischert

166. States and Capitals
Quick. What's the capital of Ohio? If you guessed Cleveland or Toledo, you'd better use this states program to refresh your memory.
Dennis Weide

February, 1983
Issue #37

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ABC

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Cover by William Giese

178. Spelling Challenger
With these three word games, your kids can learn their spelling words while having a good time.
Larry Krengel

184. Math Fun
LOAD 80
Your children will have so much fun playing with your micro that they won't even notice they're learning addition and subtraction.
David Haan

208. Michael's Game
Youngsters don't have to grow up afraid of micros. Start them off early with this game program that teaches letters and numbers.
Nancy Modney

212. Refrigerator Controller
Got an old refrigerator hanging around? This unit will let you control its lighting and temperature for all sorts of science projects.
Doug Biedenweg

237. Horse Race II
This revision of a previously published program makes it a more useful educational tool.
Danley Christensen

270. Twinkle, Twinkle, Little Star
With a little help from you and some imaginative graphics, the TRS-80 becomes a poet.
Bill Grout

In our January issue, we published a program by Bruce Tonkin called The Creator. It has since come to our attention that Software Technology for Computers (PO Box 428, Belmont, MA 02178) markets a program generator that is also called The Creator, and holds a trademark to that name. These programs are in no way related, and should not be confused with one another.

We regret any inconveniences we might have caused STC or our readers.

Young Programmer's Awards

84. Introducing the Young Programmers' Awards
We've known for some time kids make up a significant portion of our readers, but we weren't ready for this!

85. Quest for the Key of Nightshade
LOAD 80
An adventure written in Assembly language.
David Schmidt (Grand Prize)

96. Project Deep Dive
LOAD 80
Guide your sub through a winding tunnel while trying to avoid mines and torpedo launchers.
Michael John Lake (First Place, 14–18)

104. Music Composer
Store up to 200 notes on your Color Computer and save the music you've created on tape.
Carl Huben (First Place, 11–13)

108. Super Draw
LOAD 80
Make your CRT a sketch pad, save your drawings, and recall them at a later date.
Terry Myerson (First Place, 10 and under)

116. TRS–Turtle
LOAD 80
Now bring this famous teaching tool into your Tandy machine.
Larry Brackney (Second Place, 14–18)

124. The Lair of Kraken
Travel through an underwater palace battling the abominable Kraken.
Beth Norman (Second Place, 11–13)

80 Contents

132. Byte Cycles
A joystick game a la the light cycle races in TRON.
Nathan Miller (Second Place, 10 and under)

134. Boxer
Test your pugilistic skill in this nifty game involving you against the computer.
Lloyd Kupchanko (Third Place, 14-18)

149. Foreign Flag Quiz
Test your knowledge of world draperies.
Jennifer Neidenbach (Third Place, 11-13)

152. CASS-80
Have your own cassette-based bulletin-board system.
Scott Steele (Third Place, 11-13)

160. Math Countdown
A computer class programming assignment turns into a valuable learning tool.
Adam Wells (Third Place, 10 and under)

Articles

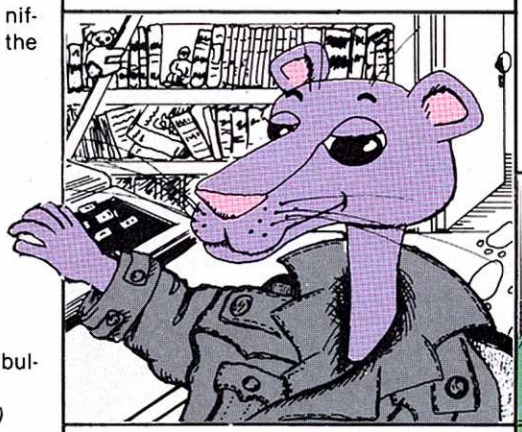
198. The Intersoft C Compiler
This version of the C language incorporates some of the ideas of Pascal and Assembly and provides some features borrowed from UNIX.
Rowland Archer

218. Son of Pilot
If you've wanted to use Pilot, but it did not work on your system, try this altered version.
Randy Hawkins

224. Cassette Index
If you want to save time when loading programs, try this index for the Color Computer.
Andrew Sensicle

228. The Model 16
An in-depth review of Tandy's 16-bit machine.
Jim Hawkes

244. The Art of Encoding and Decoding
Use your computer to translate your messages into an indecipherable mess; then with this program, you can translate them back again.
Karl Andreassen



252. LP VII Screen Printout
Reproduce the video display on paper.
Serge Calmettes

254. Fun for the Younger Set
Introduce your 5-year-old to the TRS-80 with these math and word programs.
Safi Bahcall

256. Convergem
Adjust the color and alignment of your color monitor with this Color Computer program.
James A. Sanford

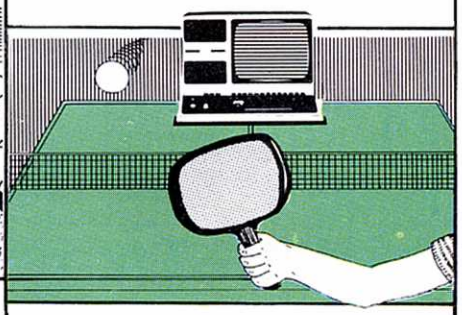
260. APL Primer—Part III
This month's installment contains a bonanza of functions. To name a few: logical operators, shaping, indexing, and reduction.
Margaret M. Grothman

280. Mod II Random Access
You can benefit from this author's migraine headaches caused by Model II mishandling of disk data.
Terry Kepner

282. Drop Your Color Computer into Disk Drive
Discover life in the fast data lane by putting the pedal to the metal oxide.
Robert Nicholas and Philip Martel

296. Screen Format Program Generator
Save yourself the trouble of figuring screen locations, field prompts, and input fields and let your computer do the work for you.
Joel Belcher

310. Peek Pong
If you thought fast-paced games couldn't be written in Basic, Peek Pong should surprise you.
Charles Gulick



314. Color Life
Watch communities of organisms develop with the Game of Life for the Color Computer.
Larry F. Perry

328. The Input Specifier
A subroutine allowing editing of input and saving your programs from crashing.
G. Schweizer

332. Color Computer Merge
Concatenate your programs on tape.
John Heusinkveld

334. Transmuter
Merge Transmuter with another program and you can relabel any and all program variables.
Jon Mark O'Connor

Departments

8. Remarks
The 16-bit fad.
Wayne Green

10. Proof Notes
Piracy becomes a political issue.

12. To Copy or Not to Copy
A reader offers a helping hand and raises a commotion.

80 Contents

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80 formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include an SASE for a copy of our writers' guidelines. Payment for accepted articles is made at a rate of approximately $50 per printed page; all rights are purchased. Authors of reviews should contact the Review Editor, 80 Pine Street, Peterborough, NH 03458.

18. Input
The new exciting PC-2. Better than On Break GOTO. Okidata 83A problems. The meaning of baud.

28. Aid
Engineering software. Last One questions. Interfacing problems Down Under. Model III Cassbox? Scientific reconstruction of auto accidents.

30. Debug
Bugs in Casino Draw Poker. Model III Graftrax. Digital Doodles. Tee for Six. Tax Estimator.

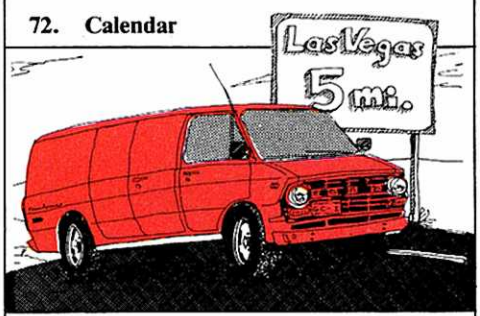
32. Anniversary Correction
Directory Information, Please correction. Here are the listings.
Charles P. Knight

37. Commander 80
Structured programming blues.
Jake Commander

46. Reviews
Quality instructional lessons with Author I. Create compiled Basic programs with The Basic Answer. Graphics-enhanced Basic. Apple Crunch, a computer crime novel. The Echo General Purpose Speech Synthesizer. DBASIC works with FLEX. Doughflo. Ultra-Term. Mikeegraphic Graphic System. Microbuffer and MXPLUS make your Epson perform like never before.

71. Review Digest
El Diablero—An Adventure Game. Telewriter, the disk version. Outhouse. Fan for the Color Computer. Roman Checkers, Tandy's Othello.

72. Calendar



80. The Gamer's Cafe
Wherein a sprite named Mercedes Silver helps Max and Rodney win back the van from Nurse Lovelace.
Rodney Gambicus

342. News
Tandy's program to help independent software writers. Isaac Asimov speaks in Brooklyn. Will rent-a-computer be a new trend? Pilot service center in Dallas may be start of something big. Custer's Revenge stirs national outrage.

364. Copernica Mathematica
Aerobic mathematics.
Bruce Powel Douglass

374. MONEY DOS
First came the hotline, now the bulletin board.
J.M. Keynes

380. Fun House
Dice games called Show Up, Drop Dead, and Martinetti.
Richard Ramella

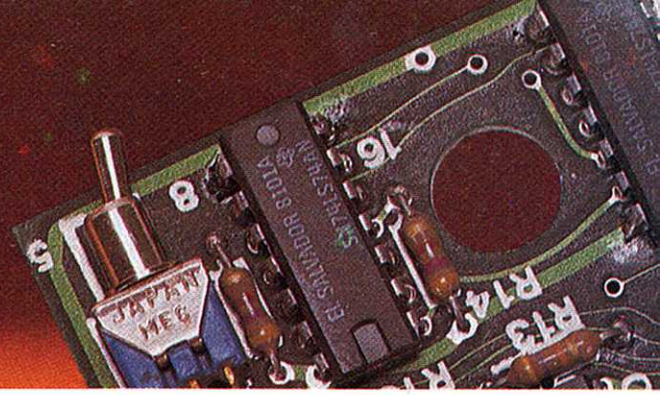
387. Index to Advertisers

406. Feedback Loop
80 to 35 tracks. Model I service manual. Expanding RAM. How to become an independent service person. Color Computer light pen. External Model III double-headed drives. Programming in English. Computer insurance.
Terry Kepner

416. Reload 80
The finer points of tape loading.
Art Huston

420. New Products
Personal Speech system. CP/M Software Index. 96K for Model I. Printer Optimizer. The Amazing Ben. Model II Locker. Micromouse. Softrol recorder switch. Zaxxon for Color Computer. Food co-op software. Bumperware 1.0.

THE SWITCH



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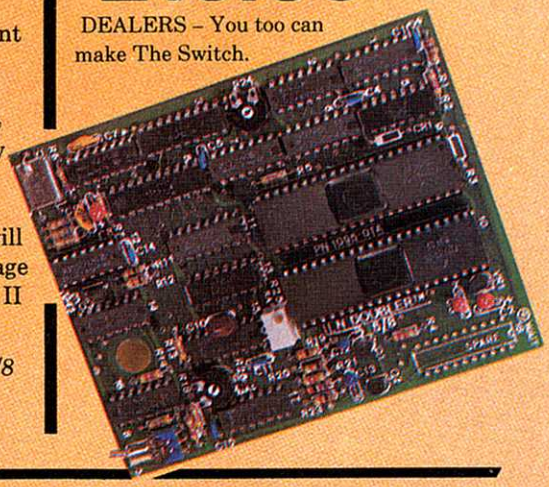

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*8" drive operation requires special cable, 8" double-density requires 3.55MHz CPU speed-up modification or LNW-80 4MHz computer. TRS-80 is a trademark of Tandy Corporation.

REMARKS

by Wayne Green

Another worry about the Model 16?

If you don't think that all eyes in the microcomputer industry—including those peering through the murk from the Tandy Towers in Fort Worth—are watching IBM, you're dreaming. As soon as news that the IBM Personal Computer was going to be using the 8088 chip (a news flash that preceded the unveiling of the computer by several months, despite the usual IBM efforts at tight security) reached central Texas, there was no further question about delaying a 16-bit computer.

Since the enthusiasm for Tandy stock seems to be tightly connected by investors to the perceived prospects of the TRS-80 computers, there seems to be a natural Tandy tendency to enhance this perception as much as possible.

Could this single-minded concentration on appearances have influenced the technical design of the Model 16? It does strike some people as curious that this system was rushed into production before the 16-bit software support was even a glimmer in the father's eye.

When one looks over the 16-bit processors on the market at present, the 68000 chip selected by Radio Shack does at first look like the best way to go. It is in many ways like the 6800 chip in that it works more in terms of a 32-bit system, but does it in 16-bit segments, just as the 8-bit chips address a 16-bit memory in two steps.

But why, you might ask, if what we really seem to be needing is a 32-bit system, are we horsing around with 16-bit chips? Indeed, I asked just this question to a designer of computers. It was then I discovered that the serious designers of desktop computers have dismissed the 16-bit chips as a temporary fad, one that will probably lead a good many of the software people astray for a few months until they realize that most businesses really need a 32-bit oriented system, at which time they will throw out all of their half-finished programs and conversions to sit down and start anew.

For those of you who are not fast with your binary numbers, an 8-bit binary number can address 256 locations. Sixteen bits allows you to address 65,536 locations. This is simplified to 64K in the ads. Since most business uses of a computer require a lot more addressable locations than that—say, for allowing the computer to sort names and addresses into zip-code order without taking months to do it—the more internal memory the computer owner can afford, the faster the system can do these number-crunching operations. But there is no use buying more internal memory (RAM) if the computer CPU can't quickly address it.

A practical limit might have been 24 bits, since this would allow the computer to directly address 16 megabytes of storage. Even with the still dropping cost of RAM memories, it is going to be a while before we even approach that limitation. We are seeing some one-megabyte RAM desktop computers (which actually take only 20 bits to address), and, with the growth of 16-bit systems that can address a 32-bit bus, I'm sure we'll soon be seeing systems with two megabytes of RAM. . . and so on. That still puts 16 MB a long, long way off. Maybe a couple of years.

A 32-bit oriented microprocessor chip is capable of substantially increasing the throughput of a computer as compared with the 16-bit-oriented units. It could be a factor of four times. Now, for the average small office where 99 percent of the time the computer is sitting around waiting for the operator, this may not be an important development. . . at least for the moment. But let's remember one of the basics of computers, Green's Axiom 107, that the more you use a computer, the more you find for it to do.

We're just starting to be serious about asking that all of our desktop computer systems be able to work with virtually any number of other computers in a network. . . or to host other smaller computers. The coming proliferation of incredibly inexpensive home computers, any of which can be pressed into service as a satellite computer for a small business network or even a home network, has to be dealt with.

One thing we know for sure, there is a raft of Japanese technicians and engineers (many of them graduates of their ham radio exposure in high school) working enthusiastically to develop LCD flat screens for the low-end computers. These will be along the lines of the pocket LCD screens on the new television sets. The $100 ($79.95 at Lechmere's) home computer, complete with 64 × 16 screen, is coming. . . soon.

Once we have that, we won't even have to buy a $69.95 black and white TV set to use for a monitor! But with or without the LCD screen, you know as well as I that home computerists will be running wires around their homes so they can have a remote computer/terminal in the kitchen, by the phone, in the living room, in the bedroom. . . hell, perhaps in the bathroom for those used to taking in a book to read.

In the office, the el cheapo computer/terminals will be networked to the host system, allowing every worker in the business to access data, swap messages, keep notes, and so on. . . all without upsetting their word processing or data entry via more traditional computers or terminals.

Such networking calls for some power in the host system, particularly as the users get involved with ever more applications. I think that this demand will put on the pressure for the desktop computer industry to move on to the 32-bit processors. . . and quickly.

But what about the software, you exclaim? In this case, the news is cheering. From what I've been able to learn, the Intel 80286 chip will run all of that nice 8080 stuff from 1976, the Z80 stuff from 1977–82, the 8086 stuff from this year. . . and so on. It will also want to have a bunch of new, higher throughput oriented programs written to really take advantage of the new 32-bit power. But at least it won't leave us high and dry as did the Radio Shack Model II and their CoCo.

Since Radio Shack seems to be committed to supporting the business market via a higher end system, I'm sure that somewhere in the bowels of one of the Tandy Towers, a dedicated team of engineers is working day and night to come up with a 32-bit computer with which to dazzle us. . . *and* the financial press. Surely they won't wait for IBM to put on the pressure again.

Will we see this by Comdex time this fall? Probably not. But then, considering the pace of the industry, can they afford to wait until their traditional August new product showing time for something as key to their future as this? ■

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13

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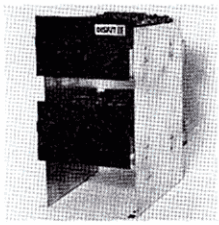

Features

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Piracy has become political issue

As we sifted through the mail concerning "To Copy or Not to Copy" (see p. 12), one point became clear: Software piracy has become a political issue.

True, some people are out there duplicating software to avoid the expense of buying it; and some are selling pirated software to make a dishonest buck. But an increasing number of consumers are copying disks and tapes as a form of retaliation. They're sticking it to an industry that they feel has been shafting them for too long.

They are, in essence, waging guerrilla warfare.

Of course, many software manufacturers conduct themselves in a responsible and professional manner. And as the industry matures, more and more companies are realizing the importance of being responsive to their customers' needs.

But we are still seeing myriad questionable business practices. Companies that advertise in computer magazines one month are nowhere to be found the next. Basement outfits with suddenly successful products find themselves unable to properly fill orders. Poor management, shifts in personnel, and changing product lines lead to inadequate after-sale support. Promises made in magazine ads turn out to be misleading or fraudulent.

It is in this atmosphere of confusion that software manufacturers are complaining about software piracy. Is it any wonder that consumers are less than sympathetic? That they are refusing in increasing numbers to buy protected software? And that they are breaking such software with so much zeal?

Unfortunately, manufacturers have tended to look at the piracy problem strictly in economic terms. As they see it, the consumer is trying to rob them of their rightful riches. So they've responded by pulling out the heavy artillery: law suits, fancier protection schemes, bloated user's manuals, and owner's registration numbers. Entire packaging and marketing plans are being influenced by efforts to stop unauthorized software duplication.

Such strategies are narrow-minded and shortsighted. They are doing nothing but encouraging further resistance. They are doomed to failure.

If manufacturers want to curb software piracy, they're going to have to take a much bigger step. They are going to have to improve their responsiveness to their customers' needs. They are going to have to provide ample proof that the loyalty and respect they demand of the consumer is reciprocated. Only then will the consumer feel any responsibility to protect the manufacturers' proprietary interests.

Unfortunately, the better companies must share the anger fostered by others. But they are also in the best position to do something about it. Perhaps the time has come for them to take the lead in guiding and policing the software industry. Perhaps they need to develop a code of ethics and take steps to enforce it.

As long as there are people who want to make a quick buck from the labors of others, software piracy will be a problem. But that problem could be curbed considerably if the software industry made a concerted effort to regain the respect of the consumer. Otherwise, we can expect the insurgency to continue for some time to come.

* * * * *

In our response to "To Copy or Not to Copy," we asked readers to advise us on whether we should publish the name of the person offering the key to backing up Super Utility Plus. The response was an overwhelming "Yes." Nevertheless, we have decided to withhold the name.

We agree with many of the comments made. Most readers would like to back up Super Utility Plus, and other software, only to guard their own interests. But we do not want to declare open season on the manufacturers of protected software. To do so, we feel, would only aggravate an already-volatile situation.

On the other hand, we understand our role as a primary source of information on the TRS-80 microcomputers.

continues on p. 29

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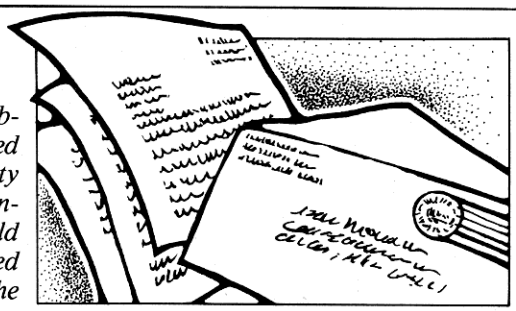
INPUT

In the November 1982 issue we published a letter from a reader who offered information on copying Super Utility Plus should Powersoft Inc. ever be unable to provide back-ups. We withheld the name of the author, and requested your reactions to both the letter and the whole subject of protected software. We also contacted eight manufacturers for their views, but only Apparat Inc. responded. Read on for some representative viewpoints. For 80 Micro*'s views on the subject, see Proof Notes on p. 10.*



To copy or not to copy

What's the Big Deal?

Why the agony on releasing the key to Super Utility?

The utility itself is designed to break others' protection, and with a modest amount of perseverance it can be broken, too. What seems odd is that you think what is sauce for the goose is not sauce for the gander.

Please release the name.

Theodore C. Hossfeld
President
Consted Productions
P.O. Box 285
Tiburon, CA 94920

Truth in Advertising

Nobody wants to buy protected programs. You know it, I know it, and the vendors know it. That's why, in spite of repeated requests, practically none of the people who sell protected programs will even mention this fact in their ads. But this matters so much to the buyer, and that's who you should be looking out for—the tens of thousands of people who pay for all the software and, directly or indirectly, all the issues of your magazine.

Why does the consumer always come last? You should require that any ad for protected software include that fact, right next to the price. And your software reviews should always address this question. When the buyer is at last given an honest choice between protected program A, and its unprotected competitor B, we will see the protection mania disappear, to everyone's benefit.

Here is an open question to Acorn, Med Systems, SubLogic, Adventure International, Powersoft, and all the other vendors who silently sell protected programs: You cannot pretend that your customers don't care about backing up the software they buy from you. So why don't you mention such a simple, well-defined, deliberate aspect of your programs in those big, fancy ads? You are purposely deceiving the very people who are supporting you. This leaves you in a poor position to complain about "software morality." You have a huge market; don't try to ignore and even subvert one of the main reasons it exists—software freedom and accessibility.

Roxton Baker
Box 8272
APO San Francisco, CA 96555

Software Collection

I collect records. Starting in the early 50s, I would tape my LPs and play the tapes. Today, I have wonderful, perfect-condition records and have upgraded my taped copies as tape quality improved. I have and will continue to handle software similarly, working only with copies of my purchased originals.

Any software that is not compatible with this approach is dead on the market as far as I'm concerned. I hope most users will adopt this philosophy. As a minimum, there ought to be a requirement that any locked software be advertised and labeled conspicuously as such.

Edward O. Noble
P.O. Box 759
Mesilla Park, NM 88047

Apparat's Answer

Apparat, like other software developers, is very concerned about piracy. In the case of the NEWDOS80 operating system, Apparat has found many illegal copies on the market. In the past, Apparat has taken some steps against software pirates, and will take much more severe steps in the months to come.

Apparat has never made software that could not be copied by the consumer, and probably never will. Our feeling is that the customer paid for the right to reproduce the software for his own personal use at the time of purchase. By limiting the number of copies, or preventing copying entirely, you may very well be limiting your customer base. Also, nothing can be locked that cannot be unlocked. And locked software can provoke many typically honest people into becoming backyard pirates.

Apparat sees only two ways to prevent, or hinder, the software piracy business. The first is the standard: registration numbers and no service if you cannot provide us with a verifiable number. The second is the hardware lock for software, similar to that used by Simutek in their Copyart word processor. The hardware lock can be duplicated also, but not easily, and most software pirates neither have the brains nor the inclination to unlock the secrets hardware can hide.

Jason Robert C. Matthews
Manager, Software R&D
Apparat, Inc.
4401 So. Tamarac Parkway
Denver, CO 80237

Routine Copies

For several years I have been quietly cracking the protection codes on games. As I have gained more experience, it has become quite routine for me to unlock the protected disks as soon as I get them, make a copy, and place the original on a shelf far from harm. Software piracy is disagreeable, but the thought of having a locked disk is equally distasteful. I would be afraid to use it, for fear that I would destroy it and never be able to use it again.

In the November 1982 issue of *80 Micro*, on page 443, the ad for Sales Data Inc. states that they will sell the

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software to allow unlimited back-ups of Scripsit and VisiCalc on the Model III. Since Scripsit for the Model III comes on a protected disk, you are clearly willing to allow mention and sales of protection-unlocking programs in your magazine. I, for one, am grateful for both of those policies.

Paul Jaeger
61 Jane St.
New York, NY 10014

Excess Aggravation

I have only purchased one protected software package. I agree with the letter writer about the aggravation, so I have promised myself never to buy another product that has this type of protection.

I fully support Logical Systems with LDOS and ABC Sales with Lazy Writer. These products are sold with serial numbers and full support for future upgrades. By providing technical support only to registered owners, they keep down the pirates and allow honest buyers unlimited back-up copies. The people making the most fuss over this are the same ones that only want to sell software for the money, with no regard for the customer after the sale.

If companies sold software at reasonable prices, there would also be less pirating. Why does the same package cost more for the Model II and III than it does for the Model I? Is this honest pricing policy?

If the author of the letter can save even one other person from getting into trouble with no back-up, he should tell others. If the goal of *80 Micro* is to provide information to help its readers (why else do we buy it?), then it also should not hold back information to please its advertisers.

Jeffrey Sherman
20 Riviera Drive
Somerville, NJ 08876

Reject Those Ads

As a responsible, consumer-oriented publishing company, you and your fellow magazine publishers can solve the protected software problem by refusing to accept ads from companies with protected software, unless you receive with such ad an unlock routine and permission to publish same in the event of the demise of the company or its inability to furnish service to owners of the software.

Spencer Trimble
229 Lipona Road South
Tallahassee, FL 32304

Preserving the Free Market

Super Utility Plus is without a doubt one of the finest utility programs ever written for the TRS-80; however, it suffers from a serious flaw. In an attempt to protect the program from unauthorized duplication, it is distributed on a protected disk. This may provide protection from pirates, but it seriously limits the usefulness of the program to the people who have paid for it.

"Maybe software manufacturers should look to their retail prices."

In this format a disk failure can force a user to pay a fee, not to mention lost work time, to obtain a new copy of the program. Every time the disk makes a revolution, magnetic coating wears off the disk. No matter how careful the user, or reliable the system, any disk will eventually wear out. We should not be forced into being dependent on any manufacturer for back-ups of programs that have been legally obtained. We find it disturbing that the program brags about its ability to duplicate protected disks while the author has ensured his own work would remain uncopied.

TRS-80 users are notorious for the use of oddball hardware configurations and patchwork systems. Users who have modified their systems usually work out patches to programs to accommodate their hardware. With a protected disk, this becomes an impossible task. The educational value of getting inside a top-notch utility like SU+ cannot be overestimated.

We don't believe back-up protected disks serve the best interest of users or publishers and are against their use. This does not mean we are against authors receiving just compensation for their work. A minority of users and crooked publishers are causing the legitimate publishers to use protected media. If the majority of users will refuse to deal with pirates, and that includes users who swap back-ups of copyrighted programs, publishers won't feel they need to use protection schemes. As a user and publisher we would rather see the free market continue.

The alternatives are government involvement or hardware protection schemes. If either of these becomes necessary, you can expect software costs to skyrocket, as well as creativity to be stifled. With unprotected software a program can reach the market with an investment of a few thousand dollars. If users force publishers to use hardware protection schemes, programs that don't have mass-market appeal will never see the light of day. All computer users have a vested interest in seeing the free market continue.

Jean Marie Witt
President
WittSoft
1302 41st St.
Orlando, FL 32805

WittSoft has recently introduced Super Duper, a program that can create copies of Super Utility Plus.—Eds.

The Price Problem

To copy in order to resell or otherwise pass on is, of course, a violation of the law. Having been so victimized, I can understand the author's point of view.

However, when we purchase a program that may be used at several stations in the building, it's a nuisance to be forced to make a several-hundred-yard round trip to pick up a disk from another room, use it for five minutes, and then return it. My vote is to release the name and address, hoping—however vainly—that resale will not occur. Maybe software manufacturers should look to their retail prices. We can afford a $40 program, but to spend $120 to have it available at three separate stations is an expense I can't justify. No one photocopies a $6 book, but a $60 one might not be so immune.

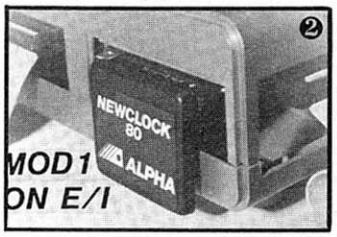
The Rev. George T. Cook
50 Anchor Ave.
P.O. Box 98
Oceanside, NY 11572

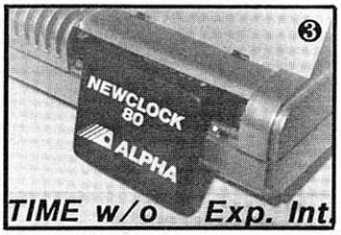
Piracy Policy

We agree with the statement that software should not be copy-protected. Staten Island Labs has some software like this, and it is very aggravat-

NEWCLOCK·80

MODEL I **MODEL III**





Wouldn't it be nice if your computer could always boot up with the right time and date and then stay accurate. Newclock-80 will enhance your Model I or III system with powerful clock/calendar/timer functions.

Using LSI (large scale integration) and custom circuits, Newclock-80 provides MO/DATE/YR, HR:MN:SEC plus AM/PM and day of week and even takes care of leap years! It continues to keep time and date with quartz accuracy when the computer is turned off or experiences a power failure. A single battery lasts over 2 years.

Compatibility: Newclock-80 is compatible with any operating system, including DOSPLUS, NEWDOS, LDOS. With its fully decoded circuitry it will work with any other hardware you may own. Bus expanders are available.

Installation is very simple, no tools, no disassembly, no soldering. Just plug it in, that's all. There is no power supply or messy cable. Newclock-80 plugs into the rear of the keyboard ❸ or side of the Exp. Int. ❷. Model III Newclock fits the 50 pin card edge (underneath) ❶

The Software: Newclock-80 is as easy to use as it is to install. -"SET", a Basic program, is used only once to set the time and date and select 12 or 24 hour format. -"TIMESTR", also in Basic, patches your computer "TIME$" function to read Newclock-80. It also adds "TIME$" to keyboard-only systems, a short routine is simply "poked" into low memory.

Newclock-80 uses 12 ports (176 to 188): 6 for the time, 6 for the date. The data is conveniently stored in decimal form, no conversion is needed. You can read or modify any digit using simple Basic "INP" and "OUT" statements.

No risk trial. Order your Newclock-80 today, see how easy it is to install and operate then decide within 30 days if you want to keep it. If for any reason you are not delighted with its quality and performance, you may return it for a prompt and courteous refund.

Your unit will come complete ❹ with software on tape, detailed instructions, handy reference card, and a 90 day warranty. Specify Model I or III. Software is also available on disk: add $5.
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ing not to have back-ups. We prefer the policies of certain software companies, such as Logical Systems Inc. and Prosoft, that support only registered owners of their programs.

Our policy toward copy-protected software is to attempt to break the lock and pirate it, not because we want the programs, but because we are against the policy of copy protection.

Philip Herbst
Senior Partner
Staten Island Labs
140 Castleton Avenue
Staten Island, NY 10301

Low Life

I am strongly opposed to pirated software! Those computerists who pirate software are the lowest form of animal life on the planet. However, I feel that any company selling software on protected disks is only one step above the pirate.

For the most part, purchasers of original software have little knowledge of how a computer works. These people pay good money to software suppliers for programs that will in some way save time, reduce mistakes, or increase productivity. Waiting for a company to send a replacement disk is at best an inconvenience and may spell disaster for a person or company that has come to rely on the program.

The pirate, on the other hand, is as cunning as a fox and patient as a saint. He views a protected program as a challenge. The better the protection scheme, the sweeter the taste of victory when it is broken—and there is no protection scheme available that cannot be broken! When the program is rendered defenseless, the pirate will move on to another challenge. For this reason, it is not in the best interest for software suppliers to protect their software and it is not in the best interest of users to purchase protected software.

James S. Schaefer
33 Jackson Road
Berlin, NJ 08009

Pathos in Advertising

First let me say that I feel the recent letter on copying locked software should have been printed as you did, without the author's name. The issue is whether as users we have rights to the software we purchase as opposed to the rights of the authors of the software.

As both an end user and a programmer, I have a tremendous amount of compassion for both sides of the question. My personal solution to the problem is to enclose a picture of my little boy with every program sold. I will also enclose a note begging people not to make illicit copies of the program or I will not be able to feed my little boy.

At prices that are competitive, I have to sell many programs to recover development time. I also need a good product that I can stand behind and support. You are important to me as a customer, so I won't lock your software. Your success in using my product directly relates to my success.

One last comment is directed to the morally concerned at *80 Micro*. You had to be kidding when you said some of the editorial staff who are of "conservative inclinations felt that to publish (the letter) would be to condone and promote an illegal (and perhaps immoral) act." A fascinating viewpoint when your magazine carries advertising for companies that promote programs that unlock other software. Your moral considerations are inconsistent and hypocritical to say the least. I applaud the side of the editorial staff that won and published the letter.

Gary A. Shade
3847 Galesburg Court
Arlington Hts., IL 60004

Positive Piracy

I have some pirated programs, but I also purchase software regularly, often after using a pirated copy. I probably would not have purchased some of the programs if I hadn't had an opportunity to try the pirated copies. In those cases, pirating was a form of advertising. In other cases, I have to say, "I'm glad I didn't pay money for this!"

I doubt that authors will stop writing software because of piracy; a good author will keep writing and keep selling because his next program will be better than his last. While piracy undoubtedly takes its toll in uncollected royalties, the prolific author can even benefit from having his programs widely circulated as more people are introduced to his work.

Protecting a disk or tape ought to be an author's prerogative. However, as a purchaser, I should be told in advertising whether a program can be backed up, as this is sometimes a factor in making the decision to buy a particular program. There is software I haven't purchased simply because I knew it was protected and I wanted to be able to back it up. In this case, protecting a disk kept an author from getting his royalty.

Tom Kilbride
4117 Lyle
Waco, TX 76710

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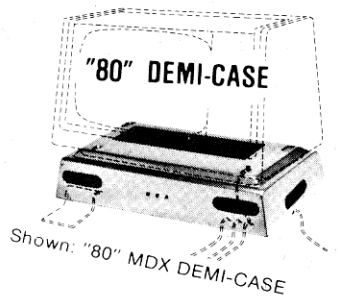

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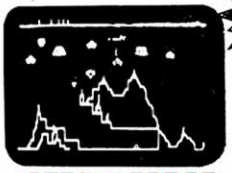
All photos are actual TRS-80 screens.

REAR GUARD

Deadly waves of enemy Cyborg craft attack your fleet from the rear. You are the Mothership's sole defender. You have unlimited firepower but the Cyborgs are swift, nimble attackers. Your abilities are tested hard in this game or lightening fast action and lively sound from Adventure International. Price: B



STRIKE FORCE

As the primary defender of a world of cities under deadly alien attack, your weaponry is the latest: rapid fire missiles, long range radar, and incendiary "star shells." Your force field can absorb only a limited number of impacts. A complex game of strategy, skill and reflexes from Melbourne House. Price: A

PANIK

Trapped at an enemy building site, your fate seems certain. Your laser is empty and evil Mzors are closing in. You'll have to climb ladders and think one step ahead of the various monsters. A challenging game for agile minds. From Fantastic Software with voice (Disk has larger vocabulary). Price: B

SEA DRAGON

Your submarine, the U.S.S. Sea Dragon, penetrates a mined enemy channel. Armed with missiles and torpedos, you engage the enemy while navigating unknown waters. Succeed or come to a salty end in this game. 29 screens of horizontally scrolling seascrape and sound from Adventure International. Price: B

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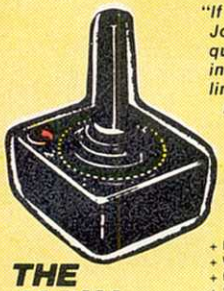

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TOP TEN

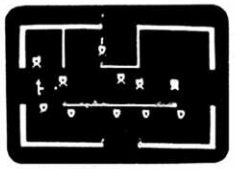
1. SCARFMAN - *All time favorite*
2. PANIK - *Remarkable Voices*
3. PENETRATOR - *Rave reviews*
4. ARMORED PATROL - *Super 3D graphics*
5. CATERPILLAR - *Good rendition*
6. CRAZY PAINTER - *Unique game concept*
7. DEFENSE COMMAND - *Tough struggle*
8. STELLAR ESCORT - *Fast and Challenging*
9. ROBOT ATTACK - *With voice*
10. SEA DRAGON - *Amazing "Seascape"*

STELLAR ESCORT

The latest super action game from Big Five. As the Federation's top space fighter you've been chosen to escort what is possibly the most important shipment in Federation history. The enemy will send many squadrons of their best fighters to intercept. With sound. Disk version has voices. Price: A

ROBOT ATTACK

Talks without a voice synthesizer, through the cassette port. With just a hand laser in a remote space station, you encounter armed robots. Some march towards you, more wait around corners. Careful, the walls are electrified. Zap as many robots as you dare before escaping to a new section. More robots await you. Price: A



LUNAR LANDER

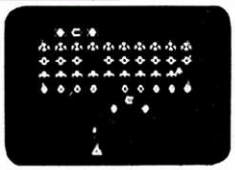
As a vast panoramic moonscape scrolls by, select one of many landing sights. The more perilous the spot, the more points scored -- if you land safely. You control LEM main engines and side thrusters. One of the best uses of TRS-80 graphics we have ever seen. From Adventure International. With sound. Price: A

SUPER NOVA

Asteroids float ominously around the screen. You must destroy the asteroids before they destroy you! (Big asteroids break into little ones). Your ship will respond to thrust, rotate, hyperspace and fire. Watch out for that saucer with the laser! As reviewed in May 1981 Byte Magazine. Price: A

OUTHOUSE

You are the mighty protector of this small (but important) wooden structure. For reasons unknown, a bizarre gang of miscreants wish to vandalize, loot and otherwise destroy the little "hall moon house." Your patrol craft has lasers and smart bombs to deal with this terror. From SSM with sound. Price: A



GALAXY INVASION

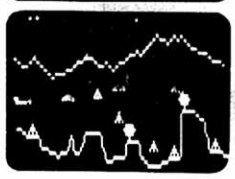
The sound of the klaxon is calling you! Invaders have been spotted warping toward Earth. You shift right and left as you fire your lasers. A few break formation and fly straight at you! You place your finger on the fire button knowing that this shot must connect! With sound effects! Price: A

LASER DEFENSE

In this game of ICBM's, high-energy lasers and particle beams, you control the U.S. strategic defense satellite system. From your viewpoint high above the globe, you intercept Soviet nuclear missiles in flight and attempt to destroy their scattered missile silos. With sound from MED Systems. Price: B

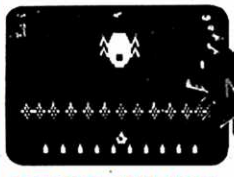
CHICKEN

Will the chicken cross the road? That's up to you. Can you guide these helpless little chicks across the perilous 10 lane super highway to safety? Or will you bumble, littering the blacktop with a storm of chicken feathers? A humourous yet challenging game of nerves from SSM with sound. Price: A



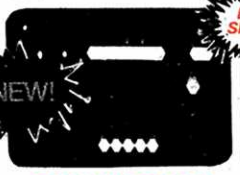
PENETRATOR

Soar swiftly over jagged landscape, swooping high and low to avoid obstacles and enemy missiles attacks. With miles of wild terrain and tunnels to penetrate, you're well armed with bombs and multiple forward missile capability. From Melbourne House. Features sound, trainer mode and customizing program. Price: C



DEFENSE COMMAND

The invaders are back! Alone, you defend the all important nuclear fuel canisters from the repeated attacks of thieving aliens, repeatedly. An alien passes your guard, snatches a canister and flys straight off. Quick! You have one last chance to blast him from the sky! With sound and voice. Price: A

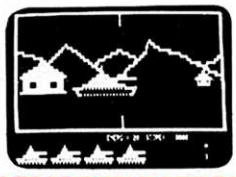


BOUNCEOIDS

Huge boulders careen off the walls. You're in the middle, in danger of being flattened. Keep your wits about you as you blast these "bounceoids" from the screen. Large ones break into many small ones. Clear a screen, and enter a fast-paced challenge stage with a chance for big bonus points. From the Cornsoft Group. Price: A

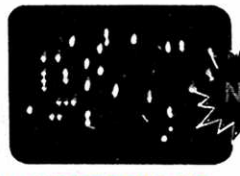
SCARFMAN

This incredibly popular game craze now runs on your TRS-80! It's eat or be eaten. You run Scrarfman around the maze, gobbling up everything in your path. Try to eat it all before nasty monsters devour you. Excellent high speed machine language action game from the Cornsoft Group. With sound. Price: A



ARMORED PATROL

A realistic tank battle simulation. Your view is a 3-D perspective of an alien landscape. Maneuver your T-36 tank to locate and destroy enemy tanks and robots that lay hidden, ready to assault you. Clever graphics create the illusion of movement and dimension. From Adventure International. With sound. Price: B



CATERPILLAR

An arcade favorite! Stop these multi-sectioned crawlers before they creep down through the mushrooms. Zap one and it splits into two smaller bugs, each with its own sense of direction. There are moths and tumble bugs too. It all adds up to lots of fun for kids and adults alike. From Soft Sector Marketing. With sound. Price code: A

CRAZY PAINTER

You have to paint the floor white. We give you the paint and brush. Sounds easy? Hah! You'll be confounded by stray dogs, snakes, sloshing buckets of turpentine, even a ravenous "paint eater." A crazy, imaginative new game with ten selectable levels of skill for new or seasoned game players. Lot's of laughs. Price: A

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INPUT

The Too New PC-2

I look forward every month to receiving each new issue of *80 Micro*. I am hoping for more PC-2 coverage. I realize PC-2 is new, just like the Color Computer was last year, so maybe I need to be patient. I hope this information arrives sooner, not later.

Doyle R. Painter, Jr.
311 Furys Ferry Road
Martinez, GA 30907

Unfortunately, we have received only a couple of articles about the exciting new Pocket Computer. Author Tim Daniel will reveal many of the secrets of the PC-2 in a future issue. Anybody out there care to help?—Eds.

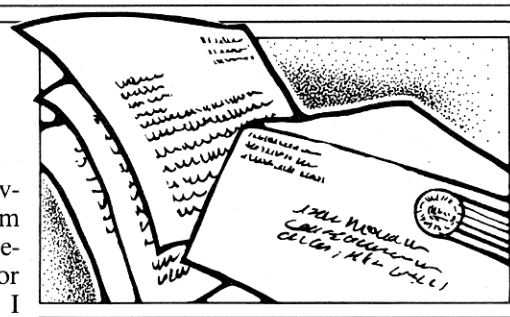
Find the Line

On Break GOTO—now, there's a good idea (*80 Micro*, November 1982, p. 390). Everybody who has used a TRS-80 has wanted this function. However, there may be a better way. The method used by SFC Donais intercepts the break vector at 16396, directs control to the sergeant's patch, which rectifies the stack and returns control to the Basic command processor with HL pointing to the first line of the program.

Basic then takes over, and, with a couple of tests, directs program flow to an appropriate Break-handling line of Basic. Wouldn't it be better to return control to Basic at the appropriate line? All we need to do this is the address of the beginning of that line.

As it happens, there is a ROM call that finds the beginning of a specified line, at 1B2CH. This is a fairly straightforward call. The DE register is loaded with the number of the line being sought, the call is made, and, on return, BC contains the address of the first byte in the line. If the line doesn't exist, control passes to the Basic error handling routine. The procedure would be:

- Call 1B8FH to rectify the stack.
- Load DE with the line number sought.
- Call the line finder at 1B2CH.
- Decrement BC to point zero before the line.
- Transfer this address to HL.
- Jump to the command processor at 1D1EH.



Program Listing 1 is the assembler code for the routine, which takes 15 bytes. Listing 2 is a rewrite of the sergeant's Basic program, altered to use the new routine. By POKEing a dif-

```
7FF1  CD8F1B     CALL    1B8FH      ;RECTIFY STACK
7FF4  113601     LD      DE,310     ;TARGET LINE #
7FF7  CD2C1B     CALL    1B2CH      ;FIND LINE
7FFA  0B         DEC     BC         ;POINT TO ZERO
7FFB  C5         PUSH    BC
7FFC  E1         POP     HL         ;TRANSFR TO HL
7FFD  C31E1D     JP      1D1EH      ;TO BASIC
                 END
```

Program Listing 1

```
100 REM *=*=*=*=*     ON BREAK GOTO ...DEMONSTRATION *=*=*=*=
110 REM
120     IF PEEK(16396)=195 GOTO 320:     'PATCH INSTALLED ?
130             REM *=*RESET MEMORY-SIZE  *=*=
140                     ADDR = PEEK(16561)+PEEK(16562)*256 - 15
150                     POKE 16562,ADDR / 256
160                     POKE 16561,ADDR - PEEK(16562) * 256
170                     CLEAR
180             REM *=*= ENTER CODE PATCH *=*=
190                     POKE 16553,255:   'ROM DATA-READ FIX
200                     START = PEEK(16561) + PEEK(16562)*256+1
210                     FOR ADDR = START TO START + 14
220                             READ CODE
230                             POKE ADDR,CODE
240                     NEXT ADDR
250             REM *=*= RESET VECTOR BACKWARDS FOR NO BOMB *=*
260                     POKE 16398,START / 256
270                     POKE 16397,START - PEEK(16398) * 256
280                     POKE 16396,195:         'JP TO PATCH
285 GOTO 320
290 REM
300 REM *=*=*  INITIALIZE BASIC VARIABLES & CONSTANTS *=*=*
310     PRINT: PRINT "--USER ABORT--":GOTO 380
320             CLEAR 50
340 REM
350 REM *=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*==*=*=*=*=*=*=*=*=*
360 REM =*=*=  NORMAL PROGRAM EXECUTION RESUMES HERE *=*=*
370 REM
380     PRINT "MEMORY =" MEM,"INPUT = "A$,"COUNT = "X
390     PRINT,"TO EXIT TEST & RESTORE TRS-80, ENTER SPACES."
400     INPUT"HOM MANY SUBROUTINES TO STACK ";A$
410     IF A$="" GOTO 500
420             X=VAL(A$)
430             GOSUB 440
440     PRINT,"MEMORY = ";MEM
450             X = X - 1
460     IF X>0 GOTO 430 ELSE 400
470 REM
480 REM *=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*=*==*
490 REM ==*  RESTORE MEMORY SIZE & BREAK VECTOR =*=*=*=
500     X=PEEK(16561)+PEEK(16562) * 256 + 15
510     POKE 16396,201
520     POKE 16562,X / 256
530     POKE 16561,X - PEEK(16562) * 256
540 REM  BASIC POINTERS ARE OKAY, STRING BUFFER INCREASED BY 15
550 REM
570 DATA 205,143,27,17,54,1,205,44,27,11,197,225,195,30,29
```

Program Listing 2

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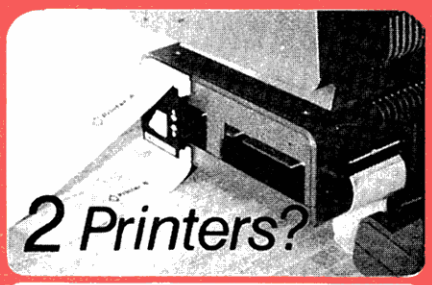

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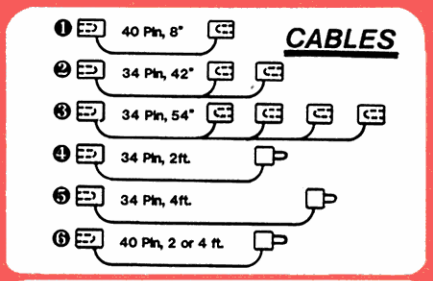

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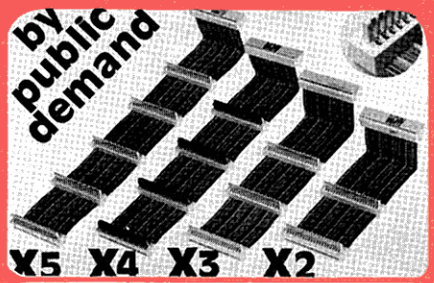

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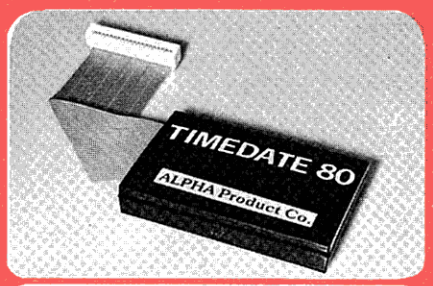

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GREEN SCREEN WARNING

IBM and all the "biggies" are using green screen monitors. Its advantages are now widely advertised. We feel that every TRS-80 user should enjoy the benefits it provides. But **WARNING:** all Green Screens are not created equal. Here is what we found:

- Several are just a flat piece of standard colored Lucite. The green tint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.
- Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobbly film gives it a poor appearance.
- One "optical filter" is in fact plain acrylic sheeting.
- False claim: A few pretend to "reduce glare". In fact, their flat and shiny surfaces (both film and Lucite type) ADD their own reflections to the screen.
- A few laughs: One ad claims to "reduce screen contrast" Sorry gentleman but it's just the opposite. One of the Green Screen's major benefits is to increase the contrast between the text and the background.
- Drawbacks: Most are using adhesive strips to fasten their screen to the monitor. This method makes it awkward to remove for necessary periodical cleaning. All (except ours) are flat. Light pens will not work reliably because of the big gap between the screen and the tube.

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A last word: We think that companies, like ours, who are selling mainly by mail should•list their street address•have a phone number (for questions and orders)•accept CODs, not every one likes to send checks to a PO box•offer the convenicnce of charging their purchase to major credit cards. How come we are the only green screen people doing it?

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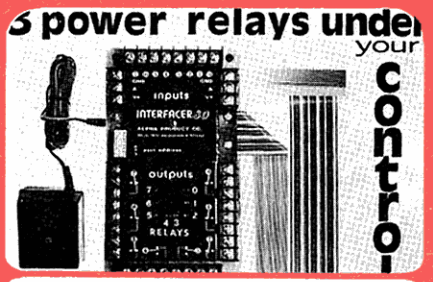

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ferent line number into START+4 (LSB) and START+5 (MSB), the routine can be made to seek any line number existing in the Basic program.

By setting the variable Break to a value dependent on the portion of the program being executed, and directing the Break-handling routine to a line containing an ON BREAK GOTO NNN,NNN,NNN statement, a press of the break key can be made to have different responses depending on where the program was when the key was pressed.

J. Stewart Schneider
2813 Louisa St.
P.O. Box 365
Catlettsburg, KY 41129

Adapting to the Future

Sure, computers can help our educational system, which is in terrible shape, but Wayne Green is a dreamer. The idea behind a proper liberal arts course is not to teach students to appreciate trees, although there is nothing wrong with that. The idea is to help these students develop thought processes and problem-solving abilities. This way, when Mr. Green's technical students find that their field has turned over so fast that the techniques they learned only two years ago in his industrial park are already outdated, they will have the ability to adapt to changes in technology that were unforeseen.

James Magliano
462 West 6 Ave.
Roselle, NJ 07203

Bugs in the Board

In your August 1982 issue of *80 Micro*, Dennis Kitsz published a PC card layout for the Radio Shack Color Computer. As an avid user of the 6809-based machine interested in generating my own specialized PROM boards, I had a prototype board made. Lo and behold, it didn't work. After many hours of debugging, the corrections for the published layout are as follows:

- The edge connector is not to the proper scale (0.100″) and could short out one's Color Computer if any further reductions are made, or if the total edge connector size is not correct.
- The traces as published are too fine for easy photocopying. My board had several micro-cracks in the traces which had to be found with an ohm meter.
- The 74LS138 (p. 348) is in backwards.
- A hole should have been provided for the cartridge interrupt self-start function (edge connector pins 7–8).

And now for the most serious bugs (see Fig. 1):

1. The trace to the edge connector pin 37 should be cut (see Fig. 2).
2. Cut the trace from the edge connector pin 20. Pin 20 is mistakenly connected to pin 19 in the drawing; this shorts A0 to A1 whereby the CoCo will not work.
3. Add a jumper from the plate-through hole below where the trace was cut in 2 above to (2K ROM C, 4K ROM D) pin 7.
4. The plate-through hole under (2K ROM A, 4K ROM C) does not connect to the IC socket pin 15. A short piece of wire soldered in the hole will make this connection.
5. With the component side up, on the edge connector, on the right side, solder a small jumper from the next to the last terminal to the hole above it and to the right.

With the above corrections made, I have successfully made the prototype board work with both 2716s and 2732s, fully populated. The lesson I learned was not to believe all that is published. We are designing our own Color Computer board with plans to hold four 2716s, four 2732s, two 2764s or one 27128.

G.W.J.K., Jr.
The Irishman's Software
P.O. Box 119
Churchville, NY 14428

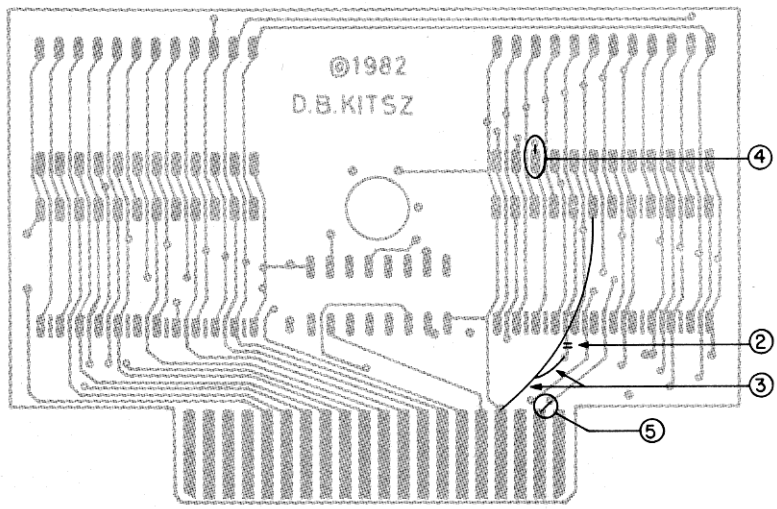

Figure 1

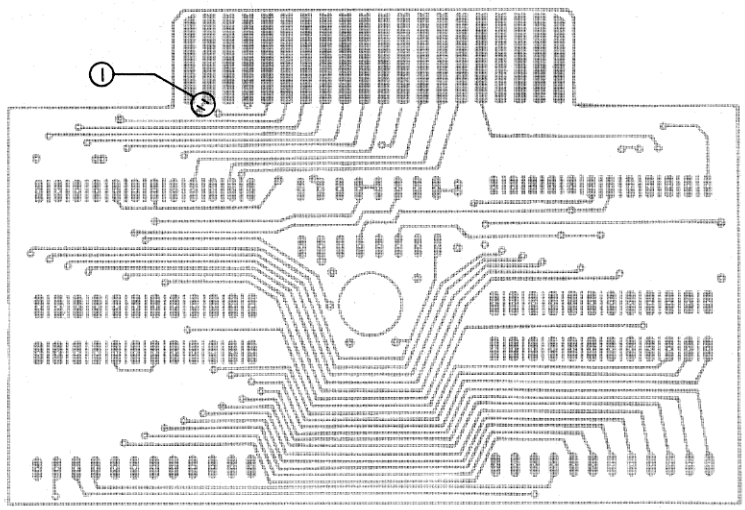

Figure 2

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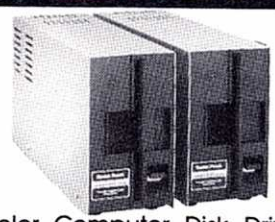

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Kitsz Comments

I'm sorry G.W.J.K., Jr. met with so much difficulty. I did double-check the published material against my own: see the Updates in this month's "Applications" for an offer to readers.

As for G.W.J.K.'s comments: My film negatives are to the proper scale of 0.1 inch, derived from 2x originals. The size error, as well as the ink dots, scratches, and blurring, was introduced during the production of the magazine, something beyond my control. The traces, however, photocopy just fine on my machine; such detail was required for the board to fit in Radio Shack's plastic case. I did reverse the 74LS138 in redrawing the parts overlay from my pencil copy.

G.W.J.K.'s five board corrections will work. I would like to offer an apology and an explanation to readers who may have been frustrated by my errors. The electronic design, two wire-wrap versions, four sets of original PC artwork and three prototypes were done and updated. The final prototype was made for me by the company who intended to sell the ROM board. I was told they had the board working; however, I failed to ask if they had made final corrections, and I further neglected to examine the prototype when I received it. My last set of artwork, which still contained errors, was sent in for publication. That company went out of business last month.

I, too, have learned a lesson from this experience, and it has made me layout-shy. Although this is the first PC layout with flaws that has appeared in print, it is the last PC layout I will produce for publication. Future articles will contain only the schematics; however, PC boards will still be available for each project, and I will give a source for them.

Dennis Kitsz
Green Mountain Micro
Roxbury, VT 05669

Secret Slip

I enjoyed James T. Demberger's "I Have a Secret" program (*80 Micro*, October 1982, p. 296). My complaint with the article is that Mr. Demberger implies that an exclusive OR (XOR) logic function could not be constructed within Level II Basic without the use of machine code. This is absolutely false! Level II Basic contains three logical operators: NOT, AND, and OR. With combinations of these three operators, any logic function can be simulated.

The XOR logic function can be simulated by taking two inputs and ANDing them with each other's inverse, then ORing the result. To test the XOR function, type and run Program Listing 3 or 4. Listing 3 displays the XOR truth table and Listing 4 is a short crypto cipher/decipher algorithm.

William T. Faulkner
5350 N. Lover Lane Road
Milwaukee, WI 53225

```
10 CLS: PRINT " TRUTH TABLE"
20 FOR A=0 TO 1
30 FOR B=0 TO 1
40 REM :::: C= A XOR B
50 C= (A AND (NOT B)) OR ((NOT A) AND B)
60 PRINT A;"XOR";B;"=";C
70 NEXT B,A
80 END
```

Program Listing 3

```
10 CLS: PRINT
20 A$="CIPHERKEY"
30 B$="MESSAGE !"
40 FOR I=1 TO 9
50 A= ASC(MID$(A$,I,1))
60 B= ASC(MID$(B$,I,1))
70 REM :: C= A XOR B :: D= A XOR C :: NOTE : B=D
80 C= (A AND (NOT B)) OR ((NOT A) AND B) 'CIPHER
90 D= (A AND (NOT C)) OR ((NOT A) AND C) 'DECIPHER
100 PRINT A;"XOR";B;"=";C;" ",A;"XOR";C;"=";D
110 NEXT I: PRINT
120 END
```

Program Listing 4

Printer Problem

I would like to share with *80 Micro* readers a problem I've encountered with the Model III and the Okidata Microline 83A printer. In Basic, a line feed is often done by using the LPRINT"" statement; however, this will not work with the Okidata 83A because of an apparent error in its ROM. A technician at Okidata indicated that the company was aware of the problem and that a new ROM would be issued sometime in the future.

When using LDOS 5.1.2, NEWDOS80, TRSDOS 1.3, or Level II, a line feed can be issued by using LPRINT or LPRINT"", but neither statement will work when using DOSPLUS 3.4 or MULTIDOS 1.1 with the Okidata 83A.

While most of our software was easily adapted to conform to the statement that the printer would accept under LDOS, Newscript 7.0 refused to eject the page or to issue line feeds between paragraphs. The people at ProSoft stated that they had not been aware of this difficulty; because the program had performed well with a Microline 80, it was assumed that it would work with the 83A. While ProSoft was willing to find a fix for the problem, I was unwilling to wait and found that Newscript will run under LDOS or DOSPLUS if the following statement is appended to line 7340 of the Script module:

:LF$ = CHR$(10)

Although not an official fix from ProSoft, this has enabled us to use the word processor without difficulties.

Any prospective buyer of the Microline 83A, which I still consider an excellent printer, should be aware of the line feed idiosyncracy and its possible incompatibility with two of the major operating systems.

Ernest Stefanik
Fax Plus Computing
373 Wilson St.
Derry, PA 15627

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The Trouble with TRS-DOS.

Although TRS-DOS is an excellent operating system, it has one major disadvantage. When compared with CP/M, TRS-DOS locks you into a limited and possibly dead-end course. When you are ready to upgrade to a new computer, it is likely that none of your present software will run on the new machine. All of the time and money you have invested in TRS-DOS software will be lost.

CP/M for the TRS-80.

Converting to CP/M offers the TRS-80 owner many advantages. The TRS-80 immediately becomes capable of running twice the software of any other computer on the market. Perhaps more importantly, CP/M permits software portability. Unlike TRS-DOS programs, CP/M programs can be directly transferred to your next computer. The savings in time and software costs can be quite significant. CP/M conversion can easily pay for itself with the money saved on one or two software purchases. The sooner you convert to CP/M, the more you stand to save.

CP/M Acquires Unprecedented Support.

Over the past year, a number of powerful competitors have introduced new microcomputers. Most people will instantly recognize the names of Xerox, IBM, Hewlett-Packard, Digital Equipment and Zenith. The Japanese companies, Sony, NEC, Sanyo, Toshiba and Sharp, are equally well-known. Together, these companies have committed over a billion dollars to compete effectively in the micro market. TRS-80 owners should be aware that every one of these companies has chosen CP/M for their standard operating system. Over the next few years, these companies will sell millions of CP/M computers. Considering these facts, it is clear that CP/M is the operating system of the future.

Apple and Commodore Offer CP/M.

In a recent press conference, the Apple Computer Company stated, "The largest installed base CP/M system in the world today is the Apple II with the Z80 card from Microsoft." In a recent full page ad in the Wall Street Journal, Apple announced CP/M for the Apple III. Commodore, refusing to be left behind, has recently announced their "Emulator" series of computers that support CP/M. There are even rumors that the new Tandy 16 will support a version of CP/M.

Plan Ahead.

The Omikron "Mapper" offers the ideal step to upgrading to a newer, more powerful computer. With the "Mapper," your TRS-80 can run both CP/M programs and TRS-DOS. With CP/M, you can build a software library that's fully compatible with the newest CP/M business computers. All of the time and money you spend on selecting, purchasing, and learning CP/M software can be considered an investment in the future. In addition, your old TRS-80 can gain a new lease on life as a fully compatible back-up unit. Consider all these points carefully. The Omikron "Works" package offers the best solution for protecting your investment in the TRS-80. By choosing the "Works," you can purchase a "Mapper" and also receive over $1,000 worth of top-quality CP/M software. Value, Utility, performance — Omikron offers you more than ever before.

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What Model II?

I recently subscribed to your magazine and found it very entertaining. A better name for your publication, however, might be *80 Micro for the Model I & III*. What I would like to see in your magazine, as you may have guessed, is more on the Model II.

Wayne C. Bucklaew
700 Etheridge Road
Chesapeake, VA 23320

Starting in March 1983, we will publish Model II versions of many of the Model I/III programs that appear in each issue. The conversions are being made by our technical staff and a cadre of 80 Micro *authors who specialize in Model II software. In addition, we remain vigilant in our efforts to obtain high-quality articles on the Model II.—Eds.*

Controversial Definition

As a senior Telecommunications Analyst, I could not believe Jay Chidsey's definition of baud (*80 Micro*, October 1982, p. 96). It does not mean "bits of audio data." Emile Baudot's name is the source of the term; he created a five-level code for data transmission many years ago, after Samuel Morse created the Morse code.

The correct definition of baud is: "The number of signal level changes per second regardless of the information content of those signals." A modem (MOdulator/DEModulator) clocks at a certain speed; that is, the timing inside the modem changes signal levels at a preset speed. The clock must time at the speed of the data being transmitted or faster. The faster the clock, the faster data can be transmitted. This does not mean that baud and BPS (bits per second) are the same. A modem can clock at 4800 or 9600 baud, but data will be transmitted at 1200 or 2400 BPS. The only time baud and BPS are interchangeable is at the speed of 1200 BPS or less. That is because the modems at those speeds usually clock at the same rate as the data. The correct way to refer to data transmission speed is by the term BPS, not baud.

I discovered a second error in Mr. Chidsey's reference to processor speed. The speed of a computer is never rated in terms of baud. Computers, either micros, minis, or large mainframes such as IBM's 303X series, are measured by the time it takes to execute a single machine code instruction. The term for this is IPS, Instructions Per Second. A mainframe like IBM's 3033 Model N is rated at a speed of about 3.6 MIPS. This means that the computer can execute 3.6 million instructions per second. Another method of comparing processors is by rating it against a benchmark machine, in this case the IBM 370/158 Model 3.

Chuck Bolvin
1234 Valley Lake Drive, Apt. 542
Schaumburg, IL 60195

Chidsey's Response

First an explanation, which is not intended to serve as an excuse. The idea of the "Bit Smitten" column was to assign a person who had writing experience and some familiarity with a TRS-80 the task of recalling questions he had in the early part of the experience of working with the computer, and then to research answers and, with the back-up of technical people on the 80 Micro *staff, write columns based on this research and on simple tips for newcomers to the micro field. "Bit Smitten" is a researched column, not one written by a computer expert. That is, however, no excuse for passing on false or inadequate information.*

Mr. Bolvin's description of the derivation of the word baud is persuasive, but I must protest to him that all three of the other authorities checked ascribe the term to "bits of audio data." Reference to a standard work, Computer Dictionary and Handbook *by Charles Sippl, Howard W. Sams & Co., Indianapolis, Kansas City and New York, confirms Mr. Bolvin's point without question.*

Further checking, with Mr. Bolvin's assistance, reveals that Emile Baudot created a five-level (or five-bit) code for use in automatic telegraph transmission (teletype). By making use of shift option, two sets of 32 characters were possible: a total of 64. The Baudot code was, however, little used in America. Donald Murray created a five-level shifted code, which is used here. American microcomputers use the eight-bit ASCII code, and are now in the process of moving to 16-bit code.

Baud and BPS are used loosely and incorrectly as synonymous by some manufacturers and advertisers of peripherals, such as modems. The rule of thumb appears to be that information on big machines, directed toward technicians, uses BPS in describing data transfer rates, and information on micros, directed toward businessmen and hobbyists, uses baud rate.

I was clearly wrong in using baud to refer to IPS as a measure of speed of execution for a single machine-code instruction within a computer. I stand abashed and instructed.

Jay Chidsey
205 East Adams St.
Green Springs, OH 44836

Subscription Solution

I am shocked by the flippant answer given by your editors to Mr. Hoover (*80 Micro*, December 1982, p. 20). Your subscribers deserve better. If it had been me, I would have complained to the postal service about mail fraud.

L.J. Kutten
201 South Central
P.O. Box 16185
St. Louis, MO 63105

It was not our intent to be flippant. We responded to Mr. Hoover's problem as quickly as possible, and resolved it three months prior to the publication of his letter. Our first priority is to serve our readers, and such matters therefore receive immediate attention. We published Mr. Hoover's letter because we were impressed by (and grateful for) the humor with which he handled a very unusual situation, and we wanted to share that humor.—Eds.

Earning Our Keep

It's articles like the one Dennis Kitsz wrote in the October 1982 issue (*80 Micro*, "Applications," p. 368) that keep me a faithful subscriber. The most-used keys on my machine, 1 and space bar, had long since stopped responding to my cleaning efforts, and were working so poorly that it seemed a trip to the Radio Shack Repair Center was inevitable. Since my Model I has been heavily modified, taking it back is not something I undertake lightly, but I couldn't figure out what the problem was.

Then along came the October issue and there was the answer! Sure enough, there were tiny cracks in the solder connecting the key contacts to the board, just as Dennis said. In a matter of

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minutes my four-year-old keyboard was working like new.

I probably would never have thought of looking that closely at the soldering, and I'm not sure the Radio Shack technician would have either; it's a tough one to catch. As a result, that article saved me somewhere between the minimum $15 labor charge and $75 for a new keyboard. When you also figure the time it saved me (taking the machine apart and at least one round trip of 1½ hours to the nearest Center and back), you can see how that one article easily paid for at least a whole year's worth of magazine.

Jim Unwin
18022 Valley Vista
Mulino, OR 97042

Leaning on the Lamp Post

Program Listing 5 is a modification on "Drunkard's Walk" (*80 Micro*, October 1982, p. 97). It provides an interesting holding pattern for those moments before inspiration strikes.

Information, at least in English, is hard to come by over here in Germany and you fill the bill for TRS-80 owners. I'm also pleased at the response time on your reader service card and of several of your advertisers.

Richard W. Stubbs
HHC, V Corps (G3)
APO NY 09079

Tandy Bonus

Despite all the warnings given in your fine magazine, I recently managed to destroy my TRSDOS system disk. Last Saturday I headed for my local Tandy store, where I have received superb service since buying my Model III 15 months ago. I duly purchased a replacement disk and received the expected lecture on how not to do what I had done.

On arriving home I booted the disk and found that not only did the directory show the usual LPC/CMD, HERZ50/BLD, etc., but full working copies of several disk dump programs and Big Five's Defense Command. I have read that Tandy is soon to start merchandising non-Tandy software, but did not think that this was the intended modus operandi!

Bryan W. Carter
219 White Oak Ridge Road
Short Hills, NJ 07078

```
0 '** IDLER
1 '** ADAPTED FROM:'DRUNKARDS WALK'(80 MICRO/OCT 82, PG 97)
2 '** BY:DICK STUBBS (HHC,V CORPS-G3 APO NY 09079)/6 OCT 82
3 '** FOR:TRS-80 MOD III(48K)(TRSDOS 1.3)
10 X=RND(127):Y=RND(47)
20 CLS:SET(X,Y)
30 Z=RND(2)
40 X=X+(RND(2)-Z)
50 Y=Y+(RND(2)-Z)
60 IFX>127ORX<0,10
70 IFY>47ORY<0,10
80 IFPOINT(X,Y)RESET(X,Y)ELSESET(X,Y)
90 RANDOM
100 Z$=INKEY$:IFZ$="",30ELSECLS
110 PRINT@527,"< B >ASIC or < T >RSDOS ?":I$=INKEY$:IFI$=""110
120 IFI$="T"CLS:CMD"S"
130 CLS:END
```

Program Listing 5

TRSDOS Patches

The following are three patches that I came up with, but I have not seen any of them published. These patches bypass the logo and copyright displays on TRSDOS when the system is reset. The last patch was written by John Ratzlaff and appeared in the September issue. These must be typed in exactly as they appear and are used on version 1.3 of TRSDOS.

```
PATCH *0:0 (ADD=4E85,FIND=21,CHG=C3)
PATCH *0:0 (ADD=4E86,FIND=6C,CHG=9D)
PATCH *0:0 (ADD=4E87,FIND=51,CHG=4E)
PATCH *0:0 (ADD=4EA9,FIND=CA,CHG=C3)
```

The first patch changes the present LD mnemonic to JP for a jump to the memory location specified by the second and third patches. The fourth patch bypasses the time and date input for the system. If you want to change the system back to the original specifications, redo the patches but switch the values for FIND and CHG of each patch.

Hermes S. Mendez
Forest Lake Academy
P.O. Box 157
Maitland, FL 32751

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Inside Information

*Those of you who are interested in contacting Craig Lindley concerning his "Inside Scripsit" articles (*80 Micro, *September, October, and December 1982), can call him in the evenings at 303-685-1786. Craig has received over 75 letters already. Unfortunately, he cannot respond to each one individually, but he'll be glad to discuss the articles with anyone who calls.—Eds.*

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Engineering Software

Can someone give me the name and address of a software distributor that is interested in programs for engineering applications?

John A. Henson, II
2011 Dawn Heights Drive
Lakeland, FL 33801

Looking for Software

I am looking for software for my Model III 48K that will let me use the cassette port from a communications receiver to input CW and translate to ASCII and display/print. This will be used for monitoring only since I don't have a ham license.

Also, I need to find someone locally who has The Last One program-generator package, and who would be willing to answer some questions I have about the operation and the efficacy of a $600 program generator.

Alfred Kohlberg, Jr.
Communications Service Company
5706 84th Avenue
New Carrollton, MD 20784
(301) 577-2023

DDC Problems

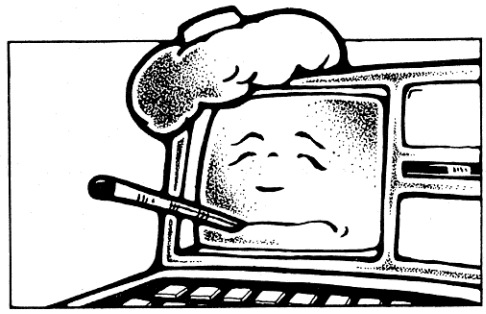
I have a System 80 with the expansion interface that has an RS-232 port and S100 capability (this is the Australian version of the American marketed PMC 80). Recently I bought the Aerocomp DDC to give me double-density capability, and found that it was not compatible with the System 80 interface.

I would appreciate information from anyone who has managed to get the DDC working in a System 80 expansion interface, the similar PMC 80 system, or in the Video Genie 80.

R.A. Ivory
P.O. Box 2320
Christchurch, New Zealand

Typing Blind

I recently purchased a Modem I with cassette software, and an extra cable to hook up the modem through the cassette port of my TRS-80 Model I. I did this so I would not have to purchase an expansion interface or an RS-232 to communicate with my school's IBM



370. There is, however, one problem. If I type in a program line, I can't see it until I list it afterwards. Also, there is no carriage return.

Has any other reader had this problem? How can I correct it? Note that the system at school is running in the half-duplex mode. Could it be a problem with the IBM 370 sending machine?

Christopher Inguanta
23-06 21st St. Apt. 6J
Astoria, NY 11105

Converted Program Wanted

I would appreciate a listing from anyone who has successfully converted the Cassbox program by Charles E. Gillen (November 1982) to work with a Model III, and an Epson MX-80 with Graftrax-Plus. I can't get the printer to print double-wide characters on the front label.

If anyone has figured out how to use the Epson control codes while using the cassette Scripsit, or if anyone knows of a good patch program, I'd like to hear from you. I want to be able to change codes while using Scripsit.

Larry E. Ierley
923 Thistle Road
Elizabethtown, PA 17022

Parts and Ribbons

In response to Bryan Headley's question (Aid, November 1982), parts and ribbons for the Base 2 Model 800 printer (printer mechanism only) can be obtained from the OEM, Two-Day Corporation, 203 East Main Street, Riverton, WY 82501 (307) 856-1111. Ribbons are $9.95 each plus shipping.

Computer Peripheral Repair, 1483 East Warner Avenue, Santa Ana, CA 92705, has made exclusive arrangements with Base 2 Corp. to support all repair work with factory-trained personnel, and to stock all major replacement parts. Minimum charge is $50 plus parts.

Neither company accepts credit cards, though the Two-Day Corp. will ship C.O.D.

Roger Parish
1712 Anna Rose Drive
Belleville, IL 62221

Police Need Help

I am interested in finding a program that will aid me in the scientific reconstruction of automobile accidents. I have a Model II with two disk drives. Can someone help?

Sgt. Michael J. Capman
Crown Enterprises
823 Parchmount Avenue
Parchment, MI 49004

Programs for the Handicapped Needed

We at the Cheshire Home for the physically handicapped are building a program library for disabled computer users. We are looking for new programs to add to this library. We already have several Apple, Pet, and TRS-80 programs. Does anyone have any programs of this nature for the ZX series of computers?

The program scope is unlimited, but please remember that many handicapped operators have restricted vision, so the display needs to be extremely clear.

Robin Nixon
Seven Springs Cheshire Home
Pembury Road,
Tunbridge Wells, Kent
England TN2 4NB

Instruction Booklet Wanted

I am desperate! I need a copy of the instruction booklet for the Voxbox (Catalog #26-1181). I bought this from a Radio Shack store about a year ago, and have been trying ever since to get the booklet. Can anyone help me?

John Marcinisen
230 Cedar Road
East Northport, NY 11731

Route Problems

I recently purchased a Model III with

the intention to use both the parallel and serial outputs directly to the matrix and daisy-wheel printers. To my dismay, I found that the serial driver cannot be used since the Route command does not function properly on the current DOS system.

Does anyone have a solution? I don't want to give up my Model III.

Stanford L. Hart
22110 Napa St.
Canoga Park, CA 91304

Coding Wand

Can anyone provide hardware and software information for using a low-cost bar-coding wand with the TRS-80 Model III? I intend to use this system for inventory control and batch number record keeping.

Jerry Ellis
Laboratory Service Company
P.O. Box 7526
Clearwater, FL 33518

Needs Help

I am trying to interface a TRS-80 Model III with two additional video monitors for use in a press operation at a motorsports facility. Any help in obtaining either a circuit or an interface box to perform this function is appreciated.

Michael F. Hollander
Racing Information Systems
7317 Haskell Avenue, Suite 214
Van Nuys, CA 91406

continued from p. 10

Thus, we will continue to accept advertisements that offer programs to back up protected software.

Furthermore, we feel strongly that whether a program is protected has become an important buying consideration for many consumers. Thus, we are encouraging our writers to include this information in their reviews. We will also solicit such information for our buyer's guides.

We hope that such steps will eventually become unnecessary. We would like to see a healthy and trusting relationship develop between microcomputerists and manufacturers. The computerists have made their feelings known in no uncertain terms. It is now up to the manufacturers to respond.

—E. M.

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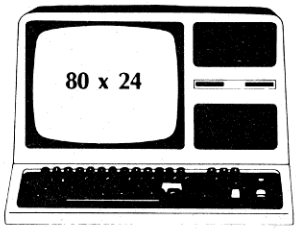

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✓See List of Advertisers on Page 387

"Practical" Corrections

The gremlins are at it again! My article "Practical Regression Analysis" (November 1982) contains three errors that might cause confusion.

● The probability subroutine found on page 102 is incorrect. The proper version is:

```
2790 ' PROB
2800 DX=D1:DY=D2:DZ=D2:FF=F:IF F<
1 THEN DY=D1:DX=D2:DZ=D1:FF=1/F
2810 DX=2/9/DX :DY=2/9/DY
2820 DD=(FF↑(1/3)*(1-DY)+DX-1)/SQR
(FF↑(2/3)*DY+DX)
2830 IF DZ<4 THEN DD=DD*(.08*DD↑4/
DZ(3+1)
2840 FP=.5/(1+DD*(.19685+DD*(.11519+
DD*(.000344+DD*.01953))))↑4
2850 IF F>=1 THEN FP=1-FP
2860 RETURN
```

● At the end of page 103, there is a "Listing continues" note. Actually, this is the end of the listing; there are no missing lines.

● The legends on page 106 are switched for Figs. 7 and 8.

Delmer D. Hinrichs
2116 S.E. 377th Avenue
Washougal, WA 98671
(206) 835-2983

Poker Correction

Thanks to Karl Weeks, I have found a couple of errors in my "Casino Draw Poker" game (November 1982). The game doesn't recognize either the royal flush or the four-of-a-kind. Since I have never gotten either, I didn't realize the problem existed until Mr. Weeks informed me of it. To correct the problem, change line 8120 to:

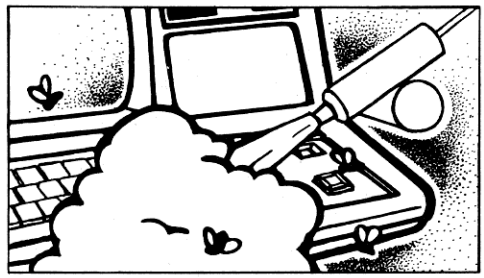
```
8120 IF (FF=1) AND (CS(5,1)=13) AND
(CS(4,1)=12) AND (CS(3,1)=11) AND
(CS(2,1)=10) AND (CS(1,1)=1) THEN WV=
9: GOTO9000
```

You must also change the WT=7 in lines 8140 and 8150 to WV=7.

Ron Balewski
412 East Ridge St.
Nanticoke, PA 18634
(717) 735-3736

Model III Graftrax

There are several bugs in the listings of Thomas McNamee's "Graftrax 80" article (September 1982).



● In line 370 a test is made for printer ready by PEEKing at location 14312 to see if it is "61." This will not work on my Model III. The number should be 63.

● The count for the number of codes, and the codes themselves, are sent out to the printer using the CHR$(X) function. Unfortunately, Basic will not send out codes of 0, 10, and 12. I recently realized that the printer was connected as a port, and that I could use the OUT &HF8, X (or in decimal, OUT 248, X) command. This results in the following changes in lines 530–540:

```
530 LPRINT CHR$(125); " ";CHR$(27)"L";
532 OUT &HF8, CC
533 IF PEEK (14312)<>63 THEN GOTO 533
535 LPRINT CHR$(255);
537 FOR T=1 TO CC: OUT &HF8, G(T)
538 IF PEEK (14312)< > 63 THEN GOTO
538
540 NEXT
```

The program comes close to the correct aspect ratio for the 960 density, but is far off for the 480 density, which I use. This can be improved by modifying the program to light two horizontally adjacent pixels, and then testing X two steps at a time.

Donald Wade
35-41 72nd St.
Jackson Heights, NY 11372
(212) 672-6399

Case Dismissed

I have had many phone calls and letters concerning the September Debug on how to connect the plotter in my "Digital Doodles" article (January 1982) to the computer. The following information will help answer these questions:

● On the left side of the schematic, the inputs to the three inverters labeled 0,1, and 2 go to the address lines 0,1, and 2. The gates labeled 04 are 74LS04s, and those labeled 02 are 74LS02s. All the plotter software is written to use output port #2 (second 74LS373 from the top). The other three ports are not needed. The reason for the other three ports is that this is the schematic for the I/O ports I use to make sure that it will work. The 74LS373s are no longer stocked by Radio Shack, but they are still sold by many advertisers in *80 Micro*.

● If you have access to the address and data lines, I don't see why the hardware should not work on a Model III. Most of the software is in Basic so there should be no problem, though the one routine in machine language may have to be changed.

Alan Sehmer
150A Lorretta Drive NW
Corrales, NM 87048
(505) 897-0955

Lucky 13 Fix

I encountered an error in Carl Bevington's article "Tee for Six" (August 1982). To play the game Lucky 13 correctly, change the 211 in line 800 to 212. Without this change a move from B to K is allowed, but the correct legal move from B to L is read as incorrect.

Hal Smith
1334 Keith Drive
Colorado Springs, CO 80916

Tax Estimator

I have received several letters concerning my "Income Tax Estimator" article (October 1982). I would like to clear up some of the questions raised by readers.

● The data used in the sample was randomly chosen for illustrative purposes, and did not represent real numbers for any particular individual. (I am not naive to allow 100,000 readers to peruse the numbers in my own return.) Given correct data, the program does produce correct results.

● The program was originally written in 1980, and submitted to *80 Micro* in 1981. Minor revisions to update to 1981 tax rules were made in 1982. Given the lead time for magazine publishing it is impossible to ensure that any tax program will still be correct by the time it is published.

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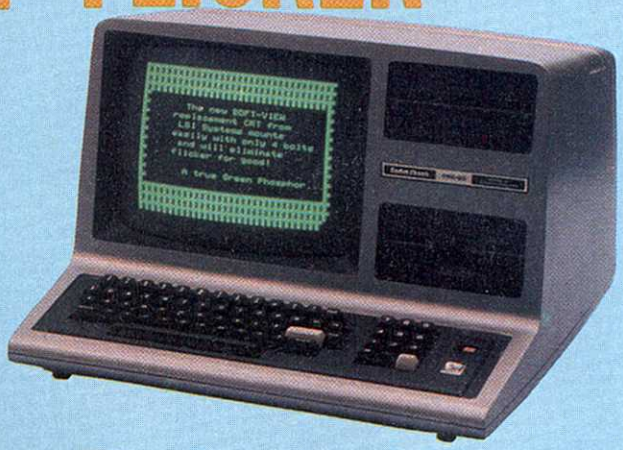

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● The program was written so that it acts as a summary program: It serves to keep track of each item, and provides a running computation of the entered data. Providing that the user makes intelligent decisions as to what to list and deduct with the new regulations in mind, the program will still provide the correct results.

● Concerning the absence of the self-employment schedule SE: This particular version was developed for the case where neither husband nor wife are subject to SE tax, because Social Security payments are fully covered by their income from wages. Since this is not the general case, the following lines should be added to the program:

```
1561 IF C1<400 THEN GOTO 1570
1562 PRINT "WITH SCHEDULE C INCOME OF $"; C1
1563 PRINT "YOU MAY BE SUBJECT TO SCHEDULE SE. CALCULATE"
1564 PRINT "ANY SELF-EMPLOYMENT TAX AND ENTER IT NOW."
1565 INPUT S1
1566 D=S1 : K$="SELF-EMPLOYMENT TAX" : GOSUB 6000
1567 X=X+S1 : D=X
```

Peter A. Stark
P.O. Box 209
Mt. Kisco, NY 10549
(914) 241-0287

Golf Fix

Helpful callers have identified a few errors in the coding of my "Callaway Golf Scoring Program" (May 1982). The changes are as follows:

```
1220 L=0:L1=0:P1=0: IF SH<>1 GOTO1270
2380 PRINT X+Y,T$(X+Y), T1(X+Y)
2400 X=X+10:IF NP>X GOTO 2370
```

Also, delete line 2360.

To use the program with a disk system, do not set the memory size, and delete lines 10–30 and 160–200. The screen-print routine will not work, but if your DOS has such a feature you can use that instead.

Rodger Wells
1008 Kehoe Drive
St. Charles, IL 60174

On page 320 of our Anniversary 1983 issue, we published an article by Charles Knight entitled "Directory Information Please" without the Program Listings. They are printed below. We apologize for the oversight.—Eds.

Program Listing 1

```
20 REM ******************************************************
40 REM ***        MAGIDEX  Disk directory Management       ***
60 REM ***        program by Charles P. Knight             ***
80 REM ***        COPYRIGHT (C) 1982 - ALL RIGHTS RESERVED ***
100 REM***                Version 1.2                      ***
120 REM******************************************************
140 CLEAR2000
160 ONERRORGOTO260
180 OPEN"I",1,"TRANSFER/DAT"
200 INPUT#1,VI,D2,D2$,DN,IN,KT$
220 CLOSE
240 GOTO280
260 IFERR=106THENRESUME280ELSEPRINT"UNRECOVERABLE ERROR":CMD"E":
PRINT"PROGRAM ABORTED:STOP
280 ONERRORGOTO0
300 G$="*"
320 CLS:PRINT@9,"Disk Directory Management Program Master Menu";

340 PRINT@67,"Requires L.D.O.S. operating system and at least 2
drives";
360 IFD2$=""THENNC$="No data in system at present - select optio
n 1"ELSENC$="Disk containing directory data should be in drive "
+RIGHT$(D2$,1)
380 PRINT@128+32-(LEN(NC$)/2),NC$;
400 PRINT@192,STRING$(64,143);
420 PRINT@284,"M E N U"
440 PRINTSTRING$(64,143);
460 PRINT"                {1}      Enter more disks"
480 PRINT"                {2}      Sort Directory data file"
500 PRINT"                {3}      Print results"
520 PRINT"                {4}      End program"
540 PRINT@320,CHR$(191);:PRINT@383,STRING$(2,191);:PRINT@447,STR
ING$(2,191);:PRINT@511,STRING$(2,191);:PRINT@575,STRING$(2,191);
:PRINT@639,CHR$(191);
560 PRINTSTRING$(64,143);
580 PRINTTAB(33)"Copyright (C) 1981 by"
600 PRINTTAB(33)"Charles P. Knight."
620 QQ=330
640 PRINT@903,"Do not press <ENTER> after entering menu selectio
n";:IFD2$<>""THENPRINT@704,"Number disks in file :";DN-1;:ELSEPR
INT@704,"File not initialized!";
660 IFKT$<>""THENPRINT@973,"Library of : ";KT$;
680 PRINT@768,"Enter selection please:";
700 CK=5
720 IK$=INKEY$:PRINT@795,IK$;:IFIK$<"1"ORIK$>"4"THEN740ELSEM=VAL
(IK$):GOTO840
740 CK=CK+2:PRINT@287+CK,CHR$(143);:PRINT@287-CK,CHR$(143);:IFCK
>30THENCK=5:PRINT@291,STRING$(28,32);:PRINT@256,STRING$(28,32);:
PRINT@795," ";:PRINT@832,"No. files in system :";IN;
760 IFQQ=330THENFL=FL+1:IFFL>32000THENFL=0
```

Listing 1 continues on p. 392

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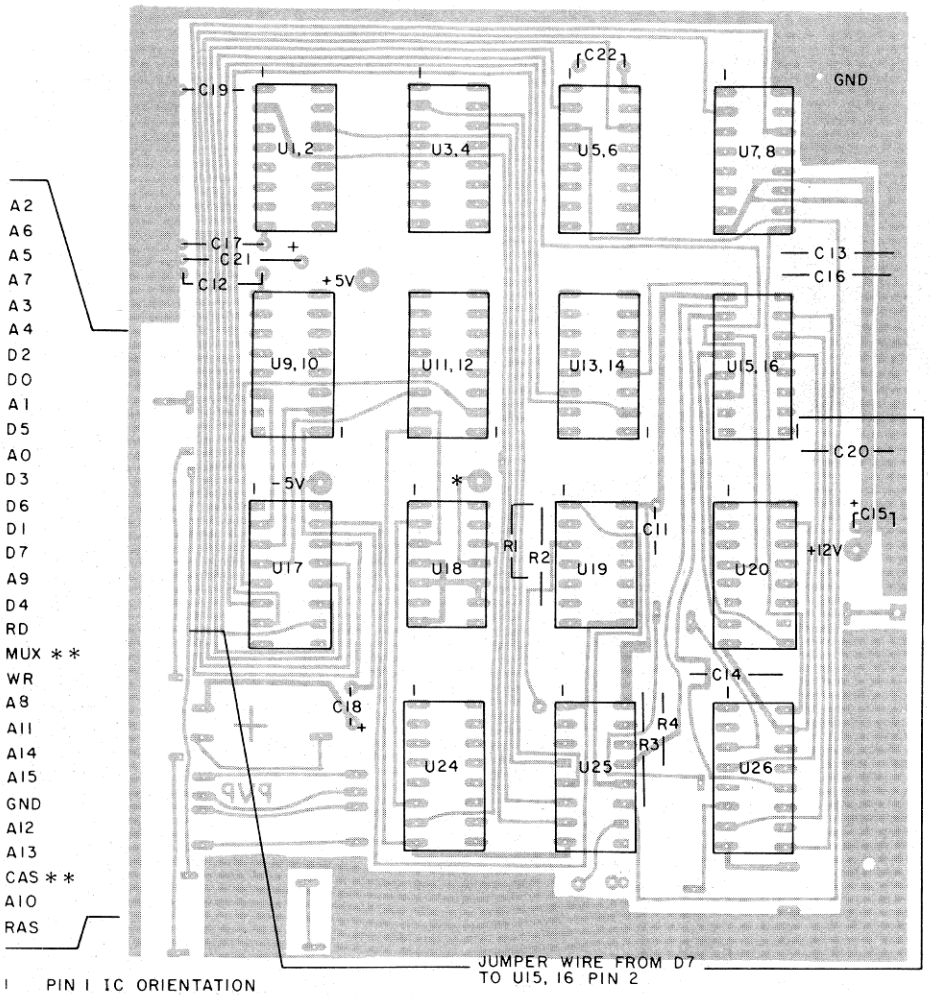

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Fig. 6a. Memory board parts placement and external connections. See Fig. 6b for U27 placement. Drill a 5/16-inch hole at the + location to allow passage of a keyboard housing post through the board. The large donut in the lower right corner denotes a board attachment site if the 32K mod will not be housed in the keyboard cabinet. Note that pin 1 orientation of IC s U9–U16 is opposite to that of the other ICs.

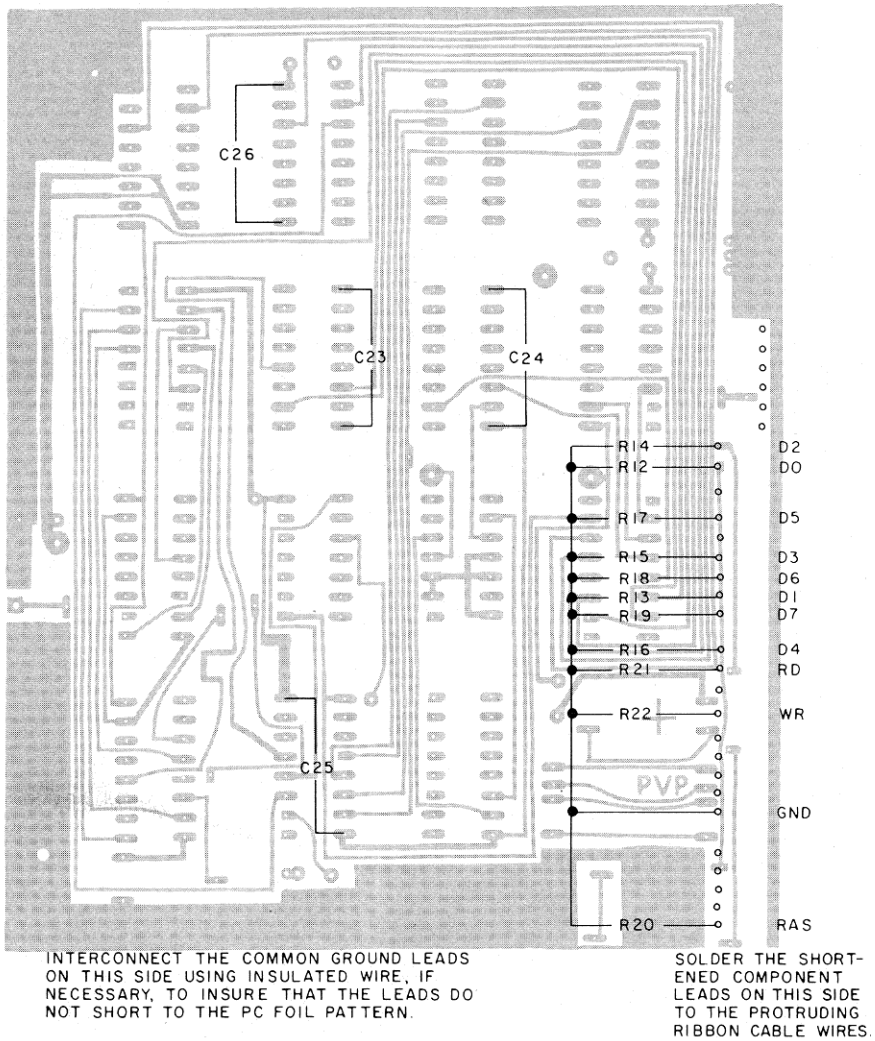

Fig. 11. Noise-suppression component placement. Install these after soldering ribbon cable to the other side of the PC board. Intall C23–C26 close to PC board, keeping leads very short.

*Above are circuit-board corrections to Philip Van Praag's "Hardware Hacker—Part II" (*80 Micro*, Nov., 1982, page 112).*

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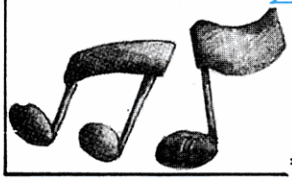

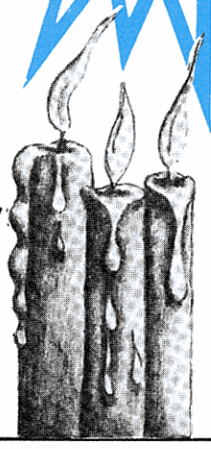

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by Jake Commander

Structured programming blues

Hey, what's this? Mmmm. Looks like some kind of box. Let's take a closer look. Hey, it's a soapbox. It looks very familiar. Friendly even. I wonder what'll happen if I stand on it. Whoooosh....

All I want is to be left alone. Just leave me in front of a computer with an idea and an editor, assembler, interpreter, or a compiler, and I'm happy. The fact that a usable piece of software results from my efforts is merely a bonus that makes programming more attractive. I really enjoy it for its own sake.

But then, along come the prophets of doom. Many times, when I read a book or an article about programming, I get preached at. Not that anyone gets on a soapbox and pontificates, but I come away with the idea that the author wouldn't approve of the way I do things. You see, I don't care a fig for how my programming ideas get in the computer as long as they work. In short, I'm an unstructured programmer, and I want to stay that way.

Maybe I feel I should be left alone with my sinful ways because I program mainly in machine code, which seems to afford me a special status. But then I fancy a change of style and write something in Basic. Then a little Pascal for dessert. I love it! Make that stupid computer jump through hoops!

But then what do I see as I leaf through a Rodnay Zaks book on Pascal? A kind of pseudo-subliminal preaching. I can understand the author of a reference on Pascal taking a stand on structured programming, but this one seems to want to herd all potential programmers into the same stable. He says that perhaps 10 percent of the programming population has a natural flair for programming and has little problem in producing a working piece of software. The other 90 percent? Well, they can come out with a finished result, but only with an effort that will be the inverse ratio of the amount of structured techniques they use.

Of course, in my programming vanity, I place myself in the upper echelons of the first 10 percent and smugly face my monitor to continue entering byte after awful unstructured byte of code. But Rodnay isn't going to let me get away with that. He trips me up with a typically structured piece of structured logic. He informs me that nearly *all* programmers consider themselves to be in that same 10 percent. Thanks, buddy.

Now my ego and conscience suffer as I continue to enter my nasty unstructured code. Am I really a talented programmer with a future, or just an egotistical computer hacker with delusions of grandeur? It seems the only way to be saved is to subscribe to the Church of the Pascalites and bow daily to the deity of disciplined programming. Well, no thanks.

Nobody tries that with composers or painters or sculptors, and nobody's going to do it with me. I love the actual medium that I work with far too much to change my style now. Other artists are allowed so-called artistic license, and I demand the same. I don't know a single artist who enjoys his work who wouldn't go bananas if told to change his style. These people develop their talents by emulating the works of other artists they admire until they finally develop their own style. And so it is with me.

I learned programming back in the 1960s under the tutelage of a book by D.D. McCracken. Good old McCracken introduced me to programming through a fictitious computer called TYDAC (for typical digital automatic computer). He assured the reader that the techniques learned would be of benefit to any programmer of almost any digital computer.

These were the wild west days of computing before sheriffs had been invented. Things were tough then. Memory (old-fashioned core-memory) was a scarce commodity and was most definitely finite. This was constraint number 1. Also, in those bad old days, computers were huge expensive monsters that cost a fortune. Consequently, time on those computers was also expensive. Results had to be produced quickly—someone else was always waiting in the wings to run his own important program. So, constraint number 2 was time.

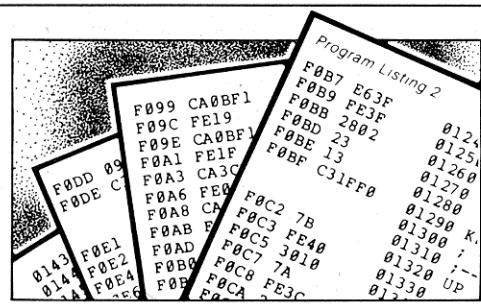
By the time he'd finished, McCracken had me wrestling with space and time to end up with working routines that had attained a mystical quality—elegance. This word isn't used any more in regard to programming, especially in the books on structured programming. Now the quality to be reached for is discipline. I had enough of that at school and I relish the freedom I achieve by assembling any byte, anywhere and anyhow I like.

The best of it is that many machine-language programmers I know share my views. Structured high-level code is OK for beginners or for people who want to learn programming without making too great an effort. But leave me and my buddies alone, we'll happily (even enthusiastically) sit down and write your next structured interpreter in any style we see fit—and that just may be unstructured code.

My legs are getting a little tired. What on earth am I doing standing on this box? I guess it's time to step down and stretch my legs. Good grief, did I just say all that stuff about structured programming? Sounds like awfully good sense to me. I have a feeling I might get on the box again next month. ■

THE NEXT STEP

by Hardin Brothers



Fixed location routines

You've learned to program your Model I or Model III efficiently in Basic. You've also started learning to program simple Assembly-language programs. You are ready for the next step.

The major topic of this column will be the techniques of combining machine language and Basic. It will cover everything from the simple first steps of language interfacing to techniques of altering Basic verbs, using the "low memory" pointers, and even creating a Basic metalanguage for special applications. Although I'll present short machine-language routines, my purpose is to show you techniques you can use for your own creations.

I make some assumptions about you. First, I assume you are working with a Model I or Model III. Although a few columns might be limited to disk-based systems, most will be equally applicable to either disk or tape Basic.

Second, I assume you have an editor/assembler program and that you can write and understand at least simple Assembly-language programs. Third, I assume you understand hexadecimal notation and can convert values from hexadecimal to decimal.

And, finally, I assume you are curious about how and why your computer works, and that you would like to make it work more efficiently.

Since the possible configurations of TRS-80 systems are many, I'll try to give values and addresses for 16K, 32K, and 48K RAMs for tape and disk systems of the Model I and Model III. At times up to 12 different values may exist for the same pointer or address. Be sure you pick the one that applies to your system.

Fixed Location Routines

The first techniques presented involve separate machine-language routines that are written to load to specific, fixed locations in memory. These techniques are most useful for long or complex routines or for routines that seem to defy all efforts at relocatable programming. Program Listing 1 does not fit these qualifications, but it is the demonstration program for this month.

Listing 1 is a short routine that "melts" all the characters on the screen; it is useful as a showy, if slow, screen clear. Its origin is at 7FE6H, which is compatible with 16K, 32K, or 48K systems. Before reading further, assemble it and save the program to either tape or disk.

Fixed location programs are easy to use, but loading them separately from your Basic program can be tedious. The only difficulty you might find is in setting the appropriate memory size pointers correctly and letting Basic know where the program is. You must set the memory size to protect the program from being overwritten by the other machinations of Basic. Because this process is different for tape and disk users, the processes for each are explained separately.

For Tape Users

Before loading and using a fixed memory routine with a Level II tape system, you must make two calculations. First, convert the lowest address of the routine to decimal to answer the "Memory Size?" prompt. Your answer tells Basic the first byte of memory it cannot use. In Listing 1, the lowest address you need to protect is 7FE6H, which equals 32742 in decimal, so you would set the memory size value at 32742.

Load the assembled machine-language program from tape and then return to the memory size prompt. How do you do that? Load the program by setting your tape recorder to the assembled program, then type SYSTEM and enter. Answer the "?" prompt with the name of the program, and the tape recorder will transfer the routine to the computer. When the routine is loaded, another "?" appears. Respond with /0 and enter, and you will return to the memory size prompt. Now enter 32741; the routine will be safely loaded and protected in memory, waiting for you to call it.

Then you face a second problem. To call the program from Basic, first tell the computer where it is. The starting

```
                00100 ;*******************************
                00110 ;*                             *
                00120 ;*  Screen Melt  --            *
                00130 ;*     to be interfaced        *
                00140 ;*     to Basic                *
                00150 ;*                             *
                00160 ;*******************************
                00170 ;
7FE6            00180          ORG     7FE6H
7FE6 21003C     00190 LOOP1    LD      HL,3C00H        ;BEG. OF SCREEN MEMORY
7FE9 010004     00200          LD      BC,400H         ;LENGTH OF SCREEN MEMORY
7FEC 1600       00210          LD      D,00H           ;RESET FINISH FLAG
7FEE 7E         00220 LOOP2    LD      A,(HL)          ;GET SCREEN CHARACTER
7FEF FE20       00230          CP      20H             ;IS IT AN ASCII SPACE?
7FF1 2803       00240          JR      Z,GO            ;GO IF IT IS
7FF3 16FF       00250          LD      D,0FFH          ;ELSE SET FLAG
7FF5 35         00260          DEC     (HL)            ;AND DECREMENT CHARACTER
7FF6 23         00270 GO       INC     HL              ;BUMP POINTER
7FF7 0B         00280          DEC     BC              ;DECREMENT COUNT
7FF8 78         00290          LD      A,B             ;GET HIGH VALUE
7FF9 B1         00300          OR      C               ;MERGE WITH LOW VALUE
7FFA 20F2       00310          JR      NZ,LOOP2        ;FINISH SCREEN
7FFC BA         00320          CP      D               ;IS D STILL ZERO?
7FFD 20E7       00330          JR      NZ,LOOP1        ;GO BACK IF NOT
7FFF C9         00340          RET                     ;ELSE RETURN TO BASIC
0000            00350          END
00000 TOTAL ERRORS
```

Program Listing 1

address (not necessarily the lowest address) of the routine must be stored in a pointer at memory positions 16526 and 16527, and your program must POKE the appropriate values there. First take the *last* two hex digits from the beginning address of the routine (E6H), convert that value to decimal (230), and POKE the result into 16526. Then take the *first* two hex digits (7FH), convert them (127), and POKE that value into 16527. For Listing 1 the line of Basic would read:

```
POKE 16526,230: POKE 16527,127
```

Finally, to use the routine, you must include a USR command in your Basic program. Since no values are to be passed to or from this routine, all you need is a statement such as Q = USR(0). Instead of Q, you can use any valid, unused numeric variable name. Instead of 0, you can place any integer inside of parentheses.

For Disk Users

Using a fixed-location routine at the top of memory involves a special consideration for disk users. Not only does the memory size have to be set so Basic leaves the routine alone, but also a special HIMEM pointer must be set to guarantee that DOS commands will not mess up the routine. The problem comes about because TRSDOS, as well as some DOSes, uses the top 256 bytes of memory as a buffer for transferring programs from disk to memory.

The address of the high memory pointer is 4049H and 404AH for the Model I, 4411H and 4412H for the Model III. The easiest way to set the pointer is with a DOS that includes a HIMEM command. For example, the Model III TRSDOS command for the screen melt program is CLEAR (MEM = 7FE5). Without a special command, you have to do some thrashing around.

From DOS Ready, load the routine from disk. Then go to Debug, display the pointer, enter the Modify mode and set the pointer to the appropriate value. Be careful, though. Because of the way the Z80 stores and retrieves data from memory, DOS expects the value to be in "normal" reversed order, with the second half of the value first.

For Listing 1, set either 4049H or 4411H to E6H and either 404AH or 4412H to 7FH. Then exit from Debug back to DOS Ready and disable Debug from interrupting other commands.

Setting high memory has one large advantage—you can ignore the memory size question entirely because Disk Basic sets the top of its allowed memory from the high memory value when you enter Basic. You can hit enter at the memory size prompt without having to convert the program address to decimal.

Avoid having to set the high memory address separately by using a special trick. Add two lines to the original Assembly source code so the program will protect itself as it's loaded. In Listing 1, add the following two lines between lines 340 and 350:

```
342    ORG     4049H
344    DEFW    7FE6H
```

With a Model III, the ORG value would be changed to 4411H.

Your second step, letting Basic know where the program starts, is easier in Disk Basic than in Level II. The DEFUSR command recognizes hexadecimal as well as decimal numbers, so instead of POKEing values into memory, include the command DEFUSR0 = &H7FE6. You can change the zero to any single digit because Disk Basic lets you point to ten separate USR routines simultaneously. If you omit the digit, Basic assumes you meant 0 and acts accordingly.

To use the routine, the Disk Basic command is Q = USR0(0). Again, you can use any of ten digits in place of the first 0, but be sure you use the same digit you used in the DEFUSR command. And again, if the digit is omitted, Basic assumes you meant 0.

For Everyone Again

Follow the above instructions and then enter and run either Program Listing 2 or Program Listing 3. Listing 2 is for those with tape systems; Listing 3 is for disk users. If all goes well, you will know you have learned to handle this first interfacing technique.

Generally, this fixed-location, separate-load technique is not used with routines as short and simple as my example. Also, the routine is put as high as possible in memory to conserve space. If you have 32K of RAM, assemble this program to 0BFE6H; with 48K RAM, the address would be 0FFE6H. Of course, you must adjust the memory size and USR pointers accordingly.

How do you calculate those addresses for your own memory size? Let the assembler do it for you. In our example, change lines 180 and 340 like this:

```
180          ORG     0000H
340 STOP     RET
```

Assemble the program with the /NO option (no output), and note the address of the STOP label in the symbol table (0019H). Then change line 180 to read:

```
180    ORG    7FFFH - 19H
```

Make the 7FFFH value equal to the highest address and the 19H value equal to the former address of STOP. Assemble the program to disk or tape, but be sure to write down the new ORG address to use later in setting the necessary pointers.

Next month I'll explain techniques for saving and loading fixed location programs as part of your Basic program. Also, for tape users, I'll present a simple technique that almost gives you the same power and flexibility that disk users have to control multiple user routines without constantly POKEing values into 16526 and 16527.

If you have comments, questions, or suggestions for future columns, please contact me through *80 Micro* or CompuServe. My EMAIL address is 72165,735. ■

```
100 '*************************************
110 '*                                   *
120 '*  Melt Demonstration --            *
130 '*          for tape systems         *
140 '*                                   *
150 '*************************************
160 '
170 CLS
180 FOR I=0 TO 1022 STEP 3
190 PRINT @ I, CHR$(RND(161)+31);
200 NEXT I
210 POKE 16526,230: POKE 16527,127
220 Q=USR(0)
230 GOTO 180
```

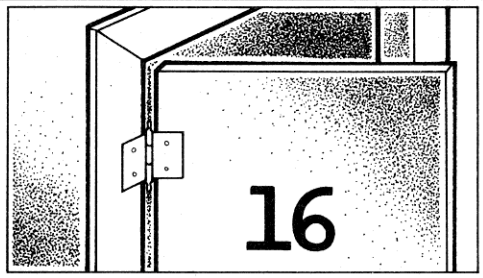
Program Listing 2

```
100 '*************************************
110 '*                                   *
120 '*  Melt Demonstration --            *
130 '*          for disk systems         *
140 '*                                   *
150 '*************************************
160 '
170 CLS
180 FOR I=0 TO 1020 STEP 3
190 PRINT @ I, CHR$(RND(161)+31);
200 NEXT I
210 DEFUSR0=&H7FE6
220 Q=USR0(0)
230 GOTO 180
```

Program Listing 3

SUITE 16

by Dan Keen and Dave Dischert



First thoughts on the Model 16

Welcome to the first installment of a column dedicated to the Model 16 and to those Model II computers that have been upgraded with the Model 16 enhancement boards.

In the months ahead we will investigate all aspects of life with the Model 16 and II/16. When new software becomes available, we will discuss it here. We also plan to clarify concepts presented in the owner's manual and the Assembler-16 manual. If you have questions about your system, let us know and we'll answer as many as possible in print.

First Impressions

One of the first things a new owner will try after uncrating the machine is to make a back-up of the TRSDOS 16* System disk. To our surprise, it cannot be done on a single-disk-drive computer! The back-up command requires at least two disk drives. With some experimentation we found this to be true also of the Model II/16 upgraded computers. Obviously this machine is designed for use by people who have large storage needs and who would normally have either two or more floppy-disk drives or a hard disk connected to it. So for those readers who plan to buy a Model 16 but are not contemplating getting a hard disk, we advise purchasing a two-disk system right away.

We tried to get around this one-drive problem by using the format command under TRSDOS 2.0* and then backing up under TRSDOS 16*. It was to no avail—under no circumstances can a back-up be made with only one disk drive.

Model 16 users who have owned a Model II will have to get in the habit of placing disks in the drives with the label facing toward the screen rather than away from it.

The disk operating system for the Model 16 was written by the Ryan-McFarland Corporation, the same

Assembly-Language Corner

The only language now available on the Model 16 is Assembly language. In this section of our column, we will explain some fundamentals of programming the MC68000 microprocessor. We plan to make comparisons to Z80 programming, since the Models I, II, and III use this chip, as does the Model 16.

What does a Model 16 Assembly-language listing look like? A sample program is in the Listing. Like any computer language, the code looks like Greek the first time you lay eyes on it. However, it is no more difficult than programming in any other Assembly language.

The frame of many programs can be developed using subroutines built into the disk operating system. These routines are referred to as supervisor calls. All peripheral addressing can be handled by supervisor routines, disk I/O, getting input from the keyboard, displaying text and information on the screen, and sending data to a printer. In the months to come, we will examine many of the commonly used supervisor calls and show various ways to put them to work within an Assembly-language program.

The Program Listing instructs the computer to clear the screen, position the cursor at the first line on the top of the screen and 36 spaces to the left, display the message "80 MICRO" centered horizontally, and finally return to the disk operating system Ready mode.

Those of you who purchase books on programming the MC68000 chip will have to do some translating. Unfortunately, the Shack Assembler-16 mnemonics and notations are not always in keeping with Motorola's syntax. This forces programmers to translate instructions in other books. The Assembler-16 manual claims the reason for this is an effort to standardize mnemonics.

The conventions and symbols referring to an address pointed to by a register (that is, indirectly addressing a register) are the first differences you might note. Some of the op-codes themselves appear different. The instruction to move data from one register to another or one memory location to another is shown as MOV in the Assembler-16 manual, yet Motorola uses MOVE.

The editor that allows development of source codes is in the same format as editors for most other microprocessors. Four columns represent label, op-code, operand, and comments.

The actual character count from left to right establishing each column is somewhat flexible. As long as there are at least two spaces between each element, then the editor assumes it to be classified under the next heading to its right. For example, if two spaces were placed between an op-code and its operand, the editor would know that the last instruction is an operand, even though it might not line up underneath the operand column. ■

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```
BEGIN
CLEAR THE SCREEN
        LDA     .A0,SVC BLOCK  *LOAD A0 WITH ADDR OF SVC
        MOVW    @A0,#8         *IDENTIFYING FUNCTION CODE
        MOVW    6@A0,#27       *CODE TO CLEAR SCREEN
        BRK     #0             *JUMP TO SUBROUTINE
*POSITION THE CURSOR
        MOVW    @A0,#10        *INDENTIFYING FUNCTION CODE
        MOVW    6@A0,#1        *ROW POSITION
        MOVW    8@A0,#36       *COLUMN POSITION
        BRK     #0             *JUMP TO SUBROUTINE
*DISPLAY A LINE OF TEXT
        MOVW    @A0,#9         *IDENTIFYING FUNCTION CODE
        MOVW    6@A0,#18       *LENGTH OF MESSAGE
        MOVW    8@A0,#13       *ASCII CODE CARRIAGE RETURN
        MOVL    10@A0,#MESSAGE   *LOADS ADDRESS OF TEXT
        BRK     #0             *JUMP TO SUBROUTINE
*RETURN TO DOS READY
        MOVW    @A0,#264  *IDENTIFYING FUNCTION CODE
        BRK     #0        *CALL SUBROUTINE
MESSAGE TEXT    '80 MICRO'
        DATAB   13        *DEFINE AN AREA OF MEMORY
                          *AND PLACE AN ASCII 13 THERE
SVC BLOCK
        RDATAB  32,0      *ESTABLISH 32 CONSECUTIVE BYTES
                          *IN MEMORY AND FILL WITH ZEROS
        END     BEGIN
```

Program Listing. Model 16 Assembly-Language Source Program

people that wrote the Model I, II, and III Cobol development packages sold in Shack stores. Accompanying the purchase of this computer is an editor/assembler disk and manual for writing Assembly-language programs for the MC68000 microprocessor. It, too, is by Ryan-McFarland. While both the assembler and the Model 16 owner's manuals contain a great deal of information, they do make a lot of assumptions. One of the goals of this column is to fill in the gaps.

Reader Forum

Users need an outlet for praises and complaints, as well as to give others answers to specific questions.

Since this is the first column to appear in this series, we haven't had the opportunity to get any feedback from readers. So we visited several Shack stores that were selling the Model 16 and asked the salesmen what the most frequent customer questions are.

One consistently asked question concerns the software available for this new machine. All software that will run on the Model II will also run on the 16 and II/16. But that software only uses the Z80 microprocessor. The MC68000, which gives the computer its powerful advantage over other micros, lies dormant. Updated versions of many programs that use the 16-bit central processing unit are being prepared for release.

You can expect programs for this machine to take advantage of its multi-user capability. This is where the Model 16 really shines. One of the main purposes for its design is to allow several people to access the machine at the same time. Naturally, you can use this machine to store a simple Profile file, but there is no point to it. Such a thing can be done on a Model II at a far lower cost.

The manager of a Radio Shack Computer Center told us that Shack plans to release a multi-user disk operating system soon. Such a system will cut up the RAM memory to enable up to three different programs to run simultaneously. Thus the system will not only be multi-user but also multitasking. One operator can print information from an accounts receivable program while another user at a remote location works on the payroll. Obviously, this microcomputer is not intended to be a personal home computer.

Some criticism has been raised concerning the release of hardware before any software is available. We applaud Shack for putting the Model 16 on the market as soon as the computer itself was ready. This allows large software houses as well as Mom-and-Pop outfits to get a jump ahead of the manufacturer and begin developing programs. More software is available for the consumer to choose from at an earlier date than if he were forced to wait for the manufacturer to develop it. We need not be dependent upon Radio Shack for programs to fit our business needs.

Plese send your questions and comments to Dan Keen and Dave Dischert, Soft Horizons, RD 1, Box 432, Cape May Court House, NJ 08210. ■

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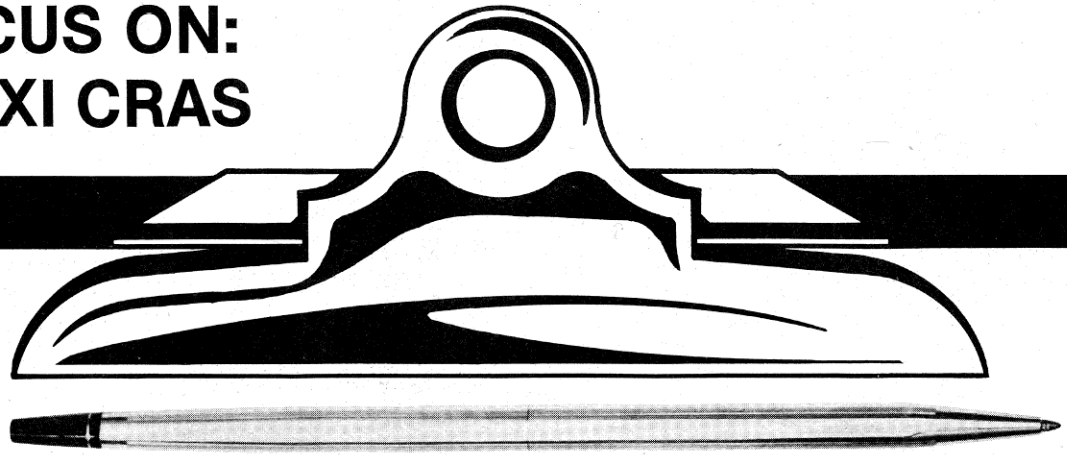

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REVIEW CONTENTS

Author I 46
The Basic Answer 48
Graphic Enhanced Basic 52
Apple Crunch 56
Echo-GP Speech Synthesizer 58
DBASIC 58
Ultra-Term 64
DoughFlo 64
Mikeegraphic Graphic System 68
Microbuffer 69
MXPLUS 69

Our reviewers use a five-star rating system. One star represents the low end of this spectrum, while five stars represent the spectacular and high end of the spectrum.

★★★★

Author I
Radio Shack
Model I and Model III
$150, Complete Package
$65, Teacher/Student Module

by Edward A. Imbier

Author I enables those who do not know a line of Basic to write quality instructional lessons that also measure what a student has gained from the learning experience.

Instead of having to settle for prepackaged software that doesn't fit a situation, an instructor with Author I can write a teaching module precisely geared to the student, the subject matter, and the proper academic level. Author I programs can measure how a class is following a lesson on the whole and which portions are not being understood. They can identify pupils who need more help; tell how long each student takes to complete up to five subsections and the whole lesson; and grade answers and compute subscores, the total score, and averages.

From the perspective of the student, Author I provides a customized, one-to-one learning experience. Who could ask for a better student/teacher ratio?

When using Author I, the student selects the gears; the computer picks the route. The program jumps over material already mastered and branches to remedial explanations when necessary. It gives hints, compliments, and scoldings when necessary. Its built-in dictionary can store definitions to words not understood by the student.

The Main Modules

The authoring package has four main modules:

Teach	Student lessons
Student	Scoring and timing files of the class
Author	Development software for constructing and editing a lesson
PRTVERF	Prints, verifies, and error-checks the labels and question groupings

After choosing the module you want, enter the name of the lesson desired. When students access the Teach module, they are asked for their names. This is for two reasons: to check if that student is allowed to take the lesson in question, and also to be able to use the student's name within the lesson for more personalized instruction. This and other character strings input by the student can be used anywhere within the lesson.

The student is escorted from page to page by pressing the space bar or the down arrow. Pages change and can contain text, questions, and glossaries. To enliven the display, text is mixed with graphics and special characters. Answers can be a single-key entry for multiple-choice questions or up to 58 keys and enter for fill-in-the-blank questions. Answers can also be selected by merely sliding the cursor over a chosen entry and pressing the enter key. Students can repeat lesson segments by using the up arrow. They are not allowed to return to the previous question page, but they do have the option of leaving the lesson by hitting the break key. Answers and the time it takes to complete a lesson are stored in the Student records module for later use.

I found operation smooth and needed very little instruction to use the Teach module. I could not get into trouble with practice lessons that I had written no matter how hard I tried.

Depending on the length of a lesson, up to 99 students can be enrolled within a given score file in the student module. A menu lets you select options to set up a score file, edit an existing one, and add students to an existing file. When examining the score file of individual students, you can choose to allow a student to have only one chance to complete a lesson (lockout mode) or several chances to complete the same lesson displaying either the current scoring and timing information (overlay mode) or an average (average mode). Scores, subscores, timings, and subtimings are available for each student. If you want a printout of an entire class, then PRTSCORE, a Basic program, must be run. Besides the normal scorekeeping and timing data, a score group section provides the total number of students whose grades fall into 10 score ranges (a frequency distribution).

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- Continuity of the ordered data (even data spanning many disks) is not limited to a "session", but is permanent.
- Optional "backing up" of your data as-you-go is an integral part of the system and is not restricted to the end of a session. This is true even for deletions.
- The length of our data fields are more than adequate to accomodate even your longest names/addresses.
- Adjusts to a 32K memory although full use is made of a 48K memory...Can be used with any DOS including TRSDOS.
- The program disk does not have to stay on line, thus freeing more space for data storage.
- Load and scroll through entire entries or selected fields. Edit as you scroll or go directly (takes about 2 sec.) to a specific entry and edit or delete.
- Our automatic repeat feature allows often used names/addresses to be entered with a single key stroke.
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- Super fast sort by alph. or zip order (8 sec. for 1000 entries). Both orders can exist **simultaneously** on disk.
- High speed recovery of entries from disk...speed of sort is meaningless if retreival from disk is slow. Ours pulls in over 11 per sec!
- Master list printout of your list in several formats (not just a rehash of labels)...extremely useful.
- Zip order is "sub-alphabetized".
- Less than 5 digit zips have leading 0's appended.
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- Permits telephone, account, and/or serial numbers, etc.
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- Transfers old files to our system. ← **LOOK!**
- Selective printout by specific zips or zip ranges.
- Plenty of user defined fields with provisions for simultaneously purging and/or selecting the printout...even allows for inequalities...Powerful and easy to use.
- Editing is simple and fast...direct access or automatic search...Batch transfer of edited entries to backup disks.
- Optionally provides for duplicate labels.
- Deleted entries have "holes" on disk filled automatically and alph. order is still maintained!
- All labels optionally support an "Attn." line with provisions for multiple entries. This permits mail to be sent to several people at given addresses...conserves disk space.
- All Ø's are replaced by easier to read 0's in addresses.
- Continuous display of number of labels/envelopes printed.
- Extensive use of error traps...even recovers from a power failure during a printout.
- Extensive assortment of extra cost options for customized master list printout (in addition to the standard one mentioned above), transfer of entries between disks, summary reports, and "publisher's" type multiple list label printouts.
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The lesson developer generates the pages for the lesson. The Author and PRTVERF modules allow editing and provide branching information and error-checking of lesson flow. Author is the screen-oriented text editor that produces the text, question, glossary, and control pages comprising a lesson. I recommend the software manual be on your lap during the branching and labeling phases of lesson production. Otherwise, it is not much needed.

Operations are smooth and slick. Mixed text and graphics and special character symbols can be easily positioned and moved around the screen. When you are finished, what you see is what you get. Arrow keys position the cursor for text and graphics entry; shift, arrow inserts and deletes a character or line; shift, @ initiates the graphics mode; double shift, @ initiates the special character mode for choosing from over 100 special characters.

Within the graphics mode, hitting the zero, period, or the enter key toggles you to the drawing, no-drawing, and erase modes. The special characters mode has a disadvantage: At least four key depressions are required to display one character. If you have a good eye, though, you can create an eye-catching display with most of the line graphics and special characters of the Model III (some limitations here for Model I users). A buffer to store various repetitive drawings would have been a timesaver.

Seven types of labels can be embedded within the text and control pages to make use of question groupings, answers, date, student's name, and a random-number generator. The number of tries to give a correct answer, as well as the points for each answer, can be selected, and the messages for responding to correct and incorrect answers can be selected in generating question pages.

A good flowchart of a lesson should be made before dealing with the branching option in this module. Control pages allow conditional and unconditional branching (with possibilities such as greater-than or equal-to question groupings or address labeling). This is probably the most difficult area to design in producing a lesson.

Basic and machine-language programs can be accessed from the Teach module if a small number of lines of code can be inserted within the external program. After the external program is run, the student automatically returns to the Teach module with scoring information. It does take about 20 seconds for even the smallest external Basic program to run and return to Author I. It would have been convenient to be able to pass variables from the external program into the Author I package. Then the system would be able to do things like generate its own math questions.

PRTVERF is a module to print, verify, and error-check a given lesson. Three error codes and eight reference codes aid you (the lesson developer) in troubleshooting your lesson.

My misgivings are not with this very able software package, but with the limitations of the Model I and III computers I tested it with. Color and a touch screen would enhance the package greatly. Early in 1983 an authoring software package will be available for the Color Computer that will be screen oriented, in color, and will make use of the built-in tone generator circuitry.

Author I is sold in two ways. A complete package with all the modules sells for $150. An abbreviated version, with just the Teach and Student modules, sells for $65 and is designed to run packaged software. One such package is a series of 150 programs sold in four modules called CARD (computer-aided reading development). Sentence, paragraph, reading for details, and comprehension are the topics these modules address.

Author I is an impressive package that can be used by even those with no Basic experience to produce interactive, good-looking lessons. ■

★★★★★

The Basic Answer
Logical Systems Inc.
11520 Port Washington Road
Meguon, WI 53092
Model I and III
$69

by G. Michael Vose
***80 Micro* staff**

The Basic Answer, or TBA, is a text-processing utility that works like an advanced computer system compiler. It allows you to create Basic program source code using a word processor or text editor and then use that textual code to produce an executable Basic program. It is designed to work only with the LDOS operating system. What makes TBA unique is that it allows you to use a descriptive, English-like syntax and it encourages the use of that ol' black magic "structured programming."

Now structured programming is a concept that frightens some computerists and is the holy grail for others. The disciples of structured programming scoff at the undisciplined masses who program in interpreted Basic, that most unstructured of all languages that allows you to GOTO and GOSUB a line number. The structuralists cringe at the idea that you can send execution to a place without a name.

The wild and unruly masses of programming mavens addicted to interpreted Basic's easygoing, meandering style—a style that lets you tack on a new idea when it comes to mind—recoil in horror at the mention of structured programming ideas like "procedures," "labels," and "compile."

In a debate between the two camps, the structuralists would argue that making each function in your program a subroutine, identified and called by a label, makes for more understandable source code—code that is much easier to read when you come back to it a year later. They would claim that isolating individual routines forces the programmer to give more thought to the overall structure of his program. The traditionalists would argue that Basic's major attraction is that it is interpreted, providing instant gratification to programmers who can write a line of code and test it immediately to see if it works. Besides, a traditionalist argues, you can write structured Basic code if you just do a little planning and flowcharting ahead of time. As for labels, what are remark statements for?

While this debate rages on, TBA steps in with a typically American solution to this problem—a compromise. TBA lets you write your source code in structured fashion, labels and all, and gives you a simple tool to create ordinary Basic code to execute at everyone's favorite time, not bedtime or mealtime, but run-time.

How It's Done

Here's how TBA works. First, you

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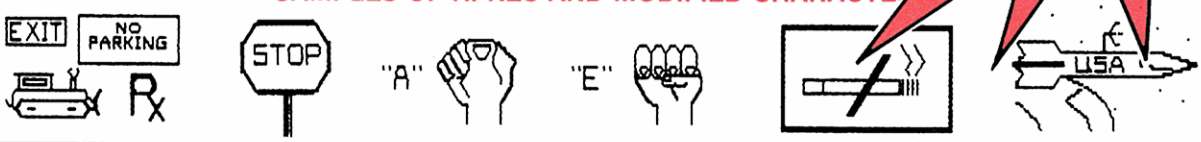

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create source code using a word processor, text editor, or even your Basic program editor. Obviously, a word processor or flexible text editor will make writing, adding or deleting characters, and changing your source code easier. You then save your source code text file in ASCII. Next, you use TBA to compile your source file into an object file—this object file will *not* be machine code, but familiar Basic code. Once your object file is created, you can load and run it as any Basic program.

"While this debate rages on, TBA steps in with a typically American solution to this problem—a compromise."

Since you must compile your source file before you attempt to run your program, there is an extra step involved in programming the TBA way. This can be annoying if you make errors in your source code since you'll find the errors only when you run your object code file. When you make errors, you must reload your source file, correct the errors, recompile the object file and run the program a second time to ascertain whether the errors have been corrected. This procedure gets tiresome very quickly and guarantees that you'll become a careful programmer in a short time.

Let's Have a Look

Listings 1 and 2 are examples of TBA source and object programs. I've used the program featured in December 1982's *80 Micro* ("TRS-80 Tongues," p. 216) as my example. The first thing you'll notice about TBA source code is that there are no line numbers used. The other major difference between the source and the object code is the variables. TBA source code allows you to use up to 14 characters for variable names, and all 14 characters are significant. Furthermore, there are two kinds of variables—local variables whose values are retained only within the routine in which they appear, and global variables whose values are maintained throughout the program.

The next major difference in TBA source code is that all GOTOs and GOSUBs are followed by labels, not line numbers. Each routine in the program is defined by a label. When you want to perform a routine, you call that routine, or procedure, to use the structuralist's term, by using its label after a GOTO or GOSUB. Therefore, your source code will specify "GOTO @Format.Screen" to call a procedure for setting up a screen display. The compiled object file will then read, less descriptively, "GOTO100" (the @ sign is used by TBA to signal that what follows is a label).

There are some other slight differences in TBA source code. All variable types must be declared each time the variable's name appears in the code—the four variable types are integer, single precision, double precision, and string. The Basic keyword REM lets you place remarks in the source code that will be carried over to the compiled object program; if you use the abbreviation for Remark (the apostrophe, '), the remark will be deleted from the object program.

Otherwise, you write TBA source code much as you would regular Basic code, using labels and no line numbers. This results in source code that looks like Pascal. Logical Systems Inc. just might legitimize Basic in the eyes of upper echelon computerists with this refined achievement.

The real power of TBA may go beyond this refinement of the Basic language, however. The writers of TBA built into the system the ability to process the source code in a variety of ways. This processing is accomplished using directives. Directives allow the writing of master source code that accommodates all possible program configurations. At processing time, the directive appropriate for a specific application is chosen to produce an object program that serves that application. An example will illustrate this concept.

TRS-80s run with a variety of peripherals—a distinction becoming more common, for example, is floppy disk versus hard disk. With TBA, it is possible to write your master source code with a directive to allow discrimination between hard- and floppy-disk operation. When processing, or compiling, the source program, you can

```
REM Fahrenheit to Celsius conversion
@beginning=count%
cls
=Celsius.temp%,Fahrenheit.tem%
     gosub @get.Cval
     Fahrenheit.tem%=(Celsius.temp% * 9/5) + 32
     print@400,Celsius.temp%"     degrees     Celsius     is
"Fahrenheit.tem%" degrees Fahrenheit"
     for count%=1to1000:next count%
     goto @beginning

@get.Cval
     print@140,"Type in the Celsius temperature";
     input Celsius.temp%
     return
```

Program Listing 1. TBA Source File

```
1 REM Fahrenheit to Celsius conversion
3 CLS
5 GOSUB 12
6 FA%=(CE% * 9/5) + 32
7 PRINT@400,CE%" degrees Celsius is "FA%" degrees Fahrenheit"
8 FOR CO%=1TO1000:NEXT CO%
9 GOTO 3
12 PRINT@140,"Type in the Celsius temperature";
13 INPUT CE%
14 RETURN
```

Program Listing 2. TBA Object File

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then choose to compile a floppy- or hard-disk version of the object program. TBA calls this conditional processing. Conditional processing provides greater flexibility and ease in programming applications that require many different conditions.

Evaluation

TBA is a very sophisticated programming tool, yet it is easy to use and learn. The documentation is similar in style to the LDOS manual. The manual is complete, professional, and full of examples of TBA features. Logical Systems does not write products that unsophisticated TRS-80 users are likely to buy, so their documentation style tends to be complicated because there is no fluff—each sentence is packed with important information.

TBA's error messages are descriptive and well thought out. As you might expect from a professional programming tool such as this one, TBA provides a cross-referenced label and variable table when processing a source file. Table 1 is the table for the sample program in Listings 1 and 2.

The generation of software products exemplified by TBA promises to push microcomputers into sophisticated new environments. Companies like Logical Systems Inc. deserve support and congratulations. ■

Procedure Label	Defn #	Line #	Referenced at Line #'s
@BEGINNING	2	3	9
@GET.CVAL	11	12	5

Variable Label	Defn #	XLATE	Referenced at Line #'s
CELSIUS.TEMP%	4	CE%	6,7,13
COUNT% *	2	CO%	8,8
FAHRENHEIT.TEM%	4	FA%	6,7

Table 1. TBA Label and Variable Table

★★★★★

Graphics Enhanced Basic
Autel Electronics
P.O. Box 11187
Albuquerque, NM 87192
Model I or III, disk only
48K RAM
$69.95

by Bruce Powel Douglass

A number of printers are now available with dot-addressable graphics: the Epson with Graftrax option, the C. Itoh 8510, and the NEC 8023A. A few programs are also available to dump screen graphics and make figures on these printers, but they are slow or inadequate for a number of applications. Graphics Enhanced Basic (GEB) solves this problem. It is a plotter language for making high-resolution figures on the Epson, C. Itoh 8510, and NEC 8023A printers.

Unlike most programs that use the high-resolution features of these printers, GEB actually interfaces with your Basic. Figures 1–3 were all done on my C. Itoh 8510 using GEB. The programs (see Listings 1–3) are all quite simple. GEB works with TRSDOS, NEWDOS80, LDOS, and MULTIDOS. It does not work with DOSPLUS.

One problem associated with making pictures on the printer is the huge amount of memory they require. GEB avoids the issue by spooling out to disk, so not all of the picture needs to be in memory at once. GEB resides in about 6K of high memory. It uses an adjustable buffer below it.

GEB allows different densities on the various printers. The Epson can run in

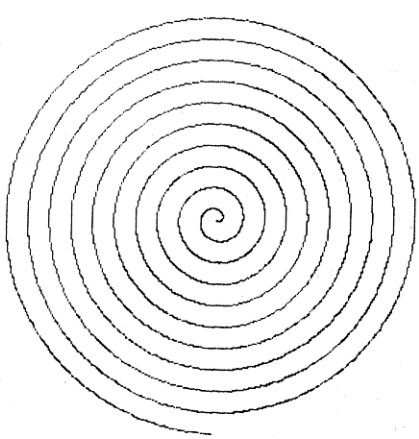

Figure 1

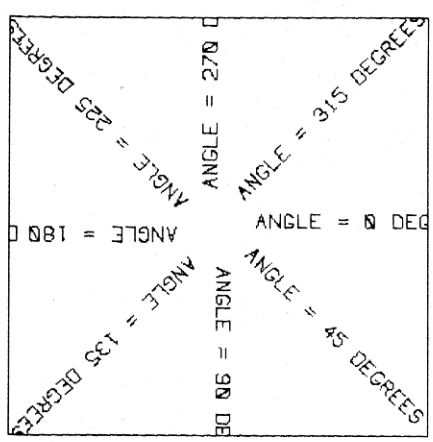

Figure 2

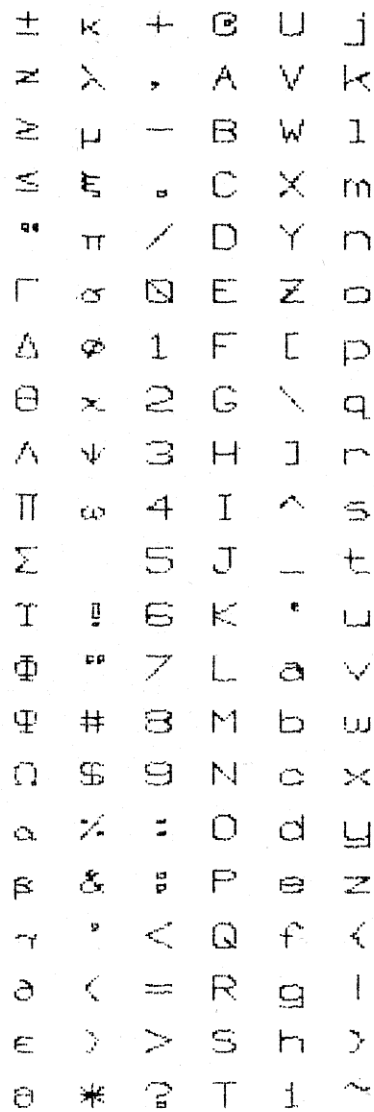

Figure 3

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The resulting custom program is truly a separate Basic program. You can list it, you can modify it, you can actually see what makes it tick. You can even ask it to print out its own operating instruction manual so others can run it for you. Finally, you can really tap the speed and power of your computer the way you really want. You can create new programs for every use you have in Business, Science, Education, and Hobby areas. And you can start now.

The software is available immediately from the creators. It comes in two versions. If you want to generate separate Basic programs with all the data handling plus Calculations and Report Printing features, you want *Quikpro+Plus*. Specify to run on TRS80 Model I and Model III at only $149; to run on TRS80 Model II at $189.

If you do not need Calculation ability or Report Printing in the separate Basic programs you will create from this program generating software, then standard *Quikpro* will do the job for you. Standard *Quikpro* to run on TRS80 Model I or Model III is $89; to run on TRS80 Model II is $129. (Later on you can always trade up to the Plus Versions for only the cost difference between the two).

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60 and 120 dots/inch density, and the C. Itoh and NEC printers allow densities of 80, 96, 136, and 160 dots/inch. For comparison, the Tandy six-pen plotter has a resolution of 200 dots/inch. The amount of memory necessary to hold all the graphics information is:

Size=length * width (inches squared) * density * 9

where Size is in bytes. This means that a page width of 8 inches, 15 inches long, with 60 dots/inch density would require a full 64K for storage. GEB performs smooth spooling of this out to disk, so you need not even be aware of the large size (except that your disk drives will be on).

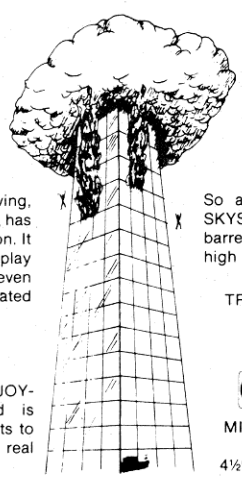
A list of the graphics commands is in Table 1. These commands form a plotting language powerful enough for virtually any application. You can draw lines, move the imaginary pen around on the plotted page, scale graphics, and move the origin about. You can rotate any number of radians (the Tandy six-pen plotter only allows you to specify four rotations) or create plots within plots with the Clip command.

One of GEB's more powerful features is its ability to print text. Not only

```
10 REM  set memory size to 47000; draws figure 1
20 ESC(27,62):REM UNIDIRECTIONAL PRINTING
30 ESC(27,63):REM BOLD PRINT SELECT
40 CLEAR 500
50 PI=3.141592654:PH=PI/4
60 BUFFER(6)
70 LIMIT(4,4)
80 OPENFILE("PLOT/GEB:1",1)
90 SETMARGIN(0,1)
100 AREA(0,8,0,8)
110 FRAME
120 ORIGIN(4,4)
130 HEIGHT(.3)
140 FOR I=0 TO 7
150 A$="  ANGLE ="+STR$(PH*I*180/PI)+" DEGREES"
160 TEXT(0,0,A$)
170 ROTATE(PH)
180 NEXT I
190 PLOT
200 CLOSE FILE
210 NPAGE
220 END
```

Program Listing 1

SKYSCRAPER



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do you have a full alphabet with numbers, you also have a predefined Greek character set, and the ability to define your own characters. The text is displayed with the TEXT(x,y,A$) command. A$ is then printed out with the first character at (x,y). You can print text at size (set by the Height command) and rotation (set by the Rotate command). The height versus width of the characters is determined by the ratio of the limits of the x and y directions in your plot.

```
10 REM  Program to generate spiral; figure 2
20 ESC(27,33)
30 REM  SET MEMORY SIZE TO 47000
40 BUFFER(6)
50 LIMIT(4,4)
60 OPENFILE("PLOT/GEB:1",1)
70 SETMARGIN(0,1)
80 AREA(-1,1,-2,2)
90 PE=3.14159:TH=PI/180:RA=1:DR=RA/3600:CLS
100 SCALE(1,2)
110 MOVE(SIN(0),COS(0))
120 FOR I=0 TO PI*20 STEP TH
130 PRINT@32,I
140 DRAW(SIN(I)*RA,COS(I)*RA)
150 RA=RA-DR
160 NEXT I
170 PLOT
180 CLOSEFILE
190 NPAGE
200 END
```

Program Listing 2

The ESC command allows you to output special escape sequences to your printer to do things like change font, force bidirectional printing, or use bold printing.

Clip lets you specify a rectangular space within the graphics page for temporary clipping. This means that you can plot figures and draw lines within this clipping area, but parts of these lines and figures that fall outside of the clipping rectangle will not be drawn. You can use Frame to draw boxes around the clipping rectangle. This gives you a number of distinct plots within a single graphics page, a powerful feature indeed!

GEB's manual, although short, contains enough information to use the program effectively. Several sample programs are provided for demonstra-

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```
10 REM set memory size to 30000
20 CLEAR 500
40 BUFFER(8)
45 LIMIT(10,8)
50 OPENFILE("PLOT/GEB:1",5)
60 SETMARGIN(0,1)
70 AREA(0,25,0,25)
90 HEIGHT(.4)
100 FOR I=1 TO 21
110 PRINT "line number ";I
120 A$=CHR$(I)+" "+CHR$(I+21)+" "+CHR$(I+42)+
" "+CHR$(I+63)+" "+CHR$(I+84)+" "+CHR$(I+105)
130 TEXT(0,22-I*.75,A$)
140 NEXT I
150 PLOT
160 CLOSEFILE
170 END
```

Program Listing 3

BUFFER—Set buffer size
CLOSEFILE—Close the current graphics file
LIMIT—Define the size of the graphics page in inches
OPENFILE—Open a disk file for graphics
PLOT—Route graphics file to the printer
SETMARGIN—Define top and left margins
NPAGE—Put printer at top of page
ESC—Send escape sequences to the printer
AREA—Scale the graphics page in user-defined units (UU)
CLIP—Define a clipping rectangle
MOVE—Move to (x,y,); no line is drawn
DRAW—Draw to (x,y); line is drawn
FRAME—Draw a rectangle around current clipping values
PUTDOT—Draw a single point
ROTATE—Rotate the effects of all subsequent commands
SCALE—Scale the results of subsequent graphics commands
ORIGIN—Define where (0,0) is (translation)
CLEARMAT—Cancel rotate, scale, and origin calls
TEXT—Display text on the graphics page
HEIGHT—Define the height of characters in UU

Table 1

tion purposes; they are printed in the manual and provided on disk. The disk also contains a text character table and the Assembly source code for the various characters. This provides a simple way to produce your own characters and create a table for your plots.

I am quite impressed with GEB and highly recommend it to anyone who has one of these printers. In fact, for most plotting needs, I recommend buying a printer that works with GEB. It is easy to take advantage of this powerful plotting language to do virtually anything that a digital plotter can do (and for less than half the cost). The only exceptions that come to mind are situations in which you need higher resolution than 160 dots per inch, plots larger than 8 by 15 inches, or multicolored plots. ■

★★★★

Apple Crunch
Frederic Vincent Huber
Hearst Corporation
Avon Books Division
New York, NY
Softcover, 264 pp.
$2.95

by Don Stauffer

The apple in Apple Crunch refers not to a Brand-X computer, but to the city of New York. Here is a fictional novel about computer crime that is contemporary, realistic, and believable—and a TRS-80 even figures prominently in several places.

The "bad" guys, a computer-school dropout and his ex-professor, are out to bilk the Big Apple out of 10 megabucks with some clever computerized extortion. After some common computer embezzlement to finance their major operation, they attempt to access, hide, and hold for ransom the information needed by the city to apply for a $200 million Federal loan. Their motive: revenge for having lost a loved one through bureaucratic bungling and apathy, combined with "computer errors."

The protagonists are a pair of city employees. Joe Copely is an aging detective, assigned to a harmless detail after his probes of graft and corruption in the NYPD irritated too many people. Klein is the chief of computer security for the city.

This pair make perfect foils for one another. Klein is long on computer and computer-security expertise, but short on investigative skills. Copely is just a streetwise cop who knows next to nothing about computers. As each teaches the other their skills, the reader is offered a fascinating glimpse into the worlds of police work and computer crime. Copely's granddaughter, a gifted child with a TRS-80, also helps in his computer education.

The author is obviously knowledgeable about computers. I did not catch any technical flaws in the entire book. His description of a TI Silent 700 is accurate even to the color of the keys. The details of police work were also very convincing, as were his descriptions of computer crime.

"This book could almost be a do-it-yourself manual for computer crime. I suspect, however, that the methods described are ones that Klein's real-life counterparts. . . deal with effectively."

This book could almost be a do-it-yourself manual for computer crime. I suspect, however, that the only methods described are ones that Klein's real-life counterparts have already learned to deal with effectively.

I thoroughly enjoyed this highly readable and suspenseful novel. A surprise ending is a delightful dessert to an excellent book. ■

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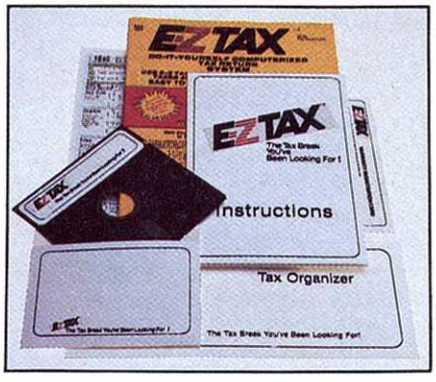

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Echo GP Speech Synthesizer
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by Bruce Powel Douglass

The Echo General-Purpose (GP) speech synthesizer is a versatile add-on built around the Texas Instruments TMS 5200 speech processor chip, an enhanced version of the chip used in Speak and Spell. It models the human voice track using linear predictive coding.

The serial version of the Echo GP requires an RS-232 interface. The parallel version, which looks just like a printer to the computer, plugs into the printer port of your expansion interface, or any Centronics-type parallel printer port. (I used the parallel version for this review.)

Routines in firmware called Text-Talker convert standard ASCII text into voice output. If you have the parallel version, you need only LPRINT your text to hear it spoken. You can access a number of features of the Echo GP by entering a CNTRL-E (CHR$(5)) followed by an appropriate command. These features include pitch control, volume control (there is also a volume knob on the front of the Echo GP), punctuation modes, speech rate, "caps" mode, letter mode, word pronunciation, and others.

You can also choose to output phonemes rather than words. This option is useful because a large number of words are incorrectly pronounced by the Echo GP. Take "begin," for example. Echo GP normally pronounces this word "be-jin." Using phonemes allows you to correct the pronunciation. The manual contains a table of commonly mispronounced words and misspellings that you can use to force correct pronunciation. For example, to pronounce "begin" correctly, you should spell it "big in." To pronounce "achieve," you should spell it "ucheeve."

You can control the voice output with the CNTRL-E command sequences. The pitch goes from male to female, and the voice can be flat or intonated. English intonation often depends on context, so although Echo cannot copy normal speaking intonations, it is an improvement over simple monotone speech.

The volume control is equally easy to control. For example, if your application for the Echo is in education, it is nice to be able to accent important words or phrases from within the program. The same is true for games.

The speech rate has a compressed mode, in which speech is almost twice as fast as normal. With just a little practice, this is still very understandable. The "caps" mode means that groups of capital letters will be spoken as single letters rather than as a word (IBM is pronounced as three separate letters instead of "ibm"). The letter mode is similar, but it spells out all words rather than pronouncing them as a whole. The Echo GP normally pronounces all words it finds unless it does not recognize it as a word (for example, "zps" will be spelled out), or if the "word" is a number. The character string 12.23 is spelled out "One Two Point Two Three."

The manual describes the phonemes used by the Echo GP and how you can use them for best results. How to place stress on syllables and how to insert pauses, as well as pitch and volume control, are all covered, and a table of phoneme codes is provided.

I am pleased with the Echo GP. It is not good for proofreading documents by routing them to the printer, since it will mispronounce many words. However, for programs that require speech synthesis, it is a useful and extremely flexible tool. An internal buffer also lets your computer continue with what it needs to do before the text has been spoken.

While speech synthesis technology is not yet to the level of human speech, it is readily understandable, and pitch and intonation control go a long ways towards making it pleasant. Certainly the Echo GP is vastly superior to those talking games that use the cassette port. The Echo GP provides a quality synthesized voice for a modest cost. ■

★★★

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by Scott L. Norman

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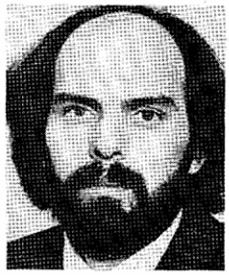

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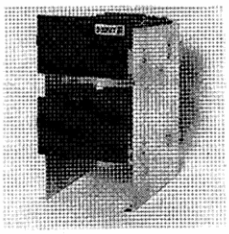

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copies the Color and Extended Color Basic ROMs to RAM so that you can use these interpreters without erasing FLEX from memory, but this is of limited use. After all, you had the Color Basics before you started! Besides, this command restricts you to cassette I/O, so it is a giant step backwards.

DBASIC

DBASIC provides a fairly inexpensive means for using Radio Shack Disk Color Basic to produce files that can be examined and manipulated by standard FLEX utilities. The actual I/O chores are handled by FLEX, but this is transparent to the user. With one exception, which I'll discuss later, you simply program in Disk Color Basic.

Getting Acquainted

DBASIC consists of two binary disk files, DBASIC.CMD and DBASIC.SYS, and a utility called RTF.BAS that converts existing Radio Shack ASCII files to FLEX format. Both DBASIC files must be present on the same disk at run time. If you purchase DBASIC and FLEX at the same time, everything will be delivered on one single-sided, double-density disk. If you purchase DBASIC separately, copy the new files to the system disk. DBASIC will only work with the Hogg Lab's implementation of FLEX and can be run on a single-drive system. A pair of drives makes life much easier, though. I'll describe operation with one drive.

Once FLEX has been booted up, the DBASIC command invokes a routine that moves the Basic interpreters from ROM to the upper half of RAM, shuffling portions of the code to avoid interference with FLEX itself. The system now reads the DBASIC.SYS file, which contains modifications to Disk Basic's initialization routine. When memory has settled, you receive two more messages: the standard Disk Extended Color Basic logo, plus one for DBASIC. The usual Color Basic cursor replaces FLEX's + + + prompt.

A couple of minor differences show up immediately; for one thing, PRINT MEM returns a value of 22567, which is 256 bytes fewer than that returned by Disk Basic immediately after startup. If the FLEX system disk is still in the drive, the DIR command can be used to obtain a directory listing. The directory format resembles that of FLEX more than that of Disk Basic, however. It displays file name, extension, file size (in 256-byte sectors, not grans), and date of file creation. The Radio Shack format includes information about file type (ASCII, binary, and so on), but this is not preserved by DBASIC; the extension has to be used to indicate the nature of each file, instead.

A few other differences are spelled out in the documentation. Disk Basic's Back-up, Copy, and DSKINI commands have been replaced by their FLEX equivalents. Print Free(0) will often return enormous numbers, since FLEX measures everything in sectors instead of grans. A new command, FLEX, has been added to the Basic vocabulary; naturally enough, it returns the system to the operating system.

For the most part, you program in DBASIC just as though FLEX didn't exist. If your program creates output files that are to be manipulated by other FLEX utilities, they should be saved in ASCII format by appending ,A to the Save command, as usual. Either a period or a slash can be used to separate the file name and extension. If you want to specify a drive number, it should precede the file name (0:MYFILE.XYZ would be appropriate). Note that a colon is required between drive number and the file name, in contrast to FLEX's period.

The one major difference between DBASIC and Radio Shack's standard Disk Color Basic is that DBASIC will not support random (direct access) files. None of the associated commands such as Field, LSET, RSET, and so on, are recognized. You can use all the commands normally used for sequential files, of course, but be aware that disk files created under DBASIC will be incompatible with standard Disk Color Basic. All cassette files, though, are compatible.

Some Simple Experiments

My first effort working with DBASIC was a short program segment that I saved to disk in ASCII format. (The BAC extension is mentioned in the documentation as a convenient way of identifying ASCII programs.) Just as advertised, programs can be reloaded with DBASIC's Load command; it can also be listed from FLEX. When I saved the same program in tokenized form, however, List wouldn't work. DBASIC would still accept it using the Load command, however, just as the original Mi-

crosoft interpreter accepts both forms of Basic programs with a single command.

Continuing the theme of manipulating files created by DBASIC, I stored a second program segment in ASCII format, making sure that its line numbers were higher than those in my first trial program. I was then able to use FLEX's Append command to merge the two segments.

I found this works with data files, too. As a quick test, I copied and ran the simple checkbook program that appears on page 28 of the Radio Shack Disk System manual. The output file, CHECKS.DAT, was automatically generated in ASCII. This is where I first got a glimpse of the advantages of running under a full-fledged DOS; I could use FLEX's List command to examine the data file, independent of the program that created it.

In principle, other utilities then could have been used to work on the file. Of course, this flexibility requires that you pay a little more attention to system operation than is required for stock Basic. For example, when running DBASIC it is quite possible to load an ASCII file that is not a program. The consequences may be interesting, but they are unlikely to prove useful!

Using Stock Programs

DBASIC would be of very limited interest if it were unable to use programs written for the standard Color Basics—subject to the sequential file restriction, of course. Therefore, I decided to try running a fairly serious commercial program under FLEX via the DBASIC package. The example I chose was Trans Tek's C.C. Writer (CCW) word processor, a friendly line-oriented editor that I often use for correspondence.

C.C. Writer is written in Basic and outputs ASCII text files, so it seemed to be a natural candidate. Trusting to dumb luck, I booted FLEX, called DBASIC, and loaded the cassette containing the master copy of CCW; standard practice is for each user to make his or her own disks from the tape.

Everything went like clockwork. At the end of the loading process, a DBASIC disk catalog appeared on screen, verifying that the various files making up C.C. Writer at this stage were indeed present. CCW's loader program puts the two main program segments, CCW.DAT and CONVERT.

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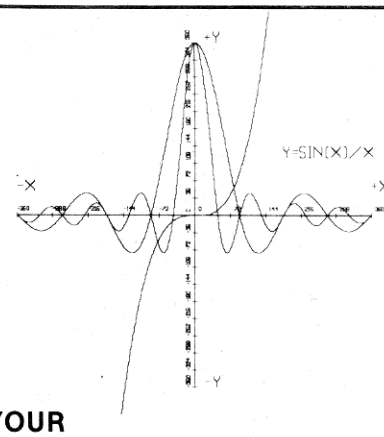

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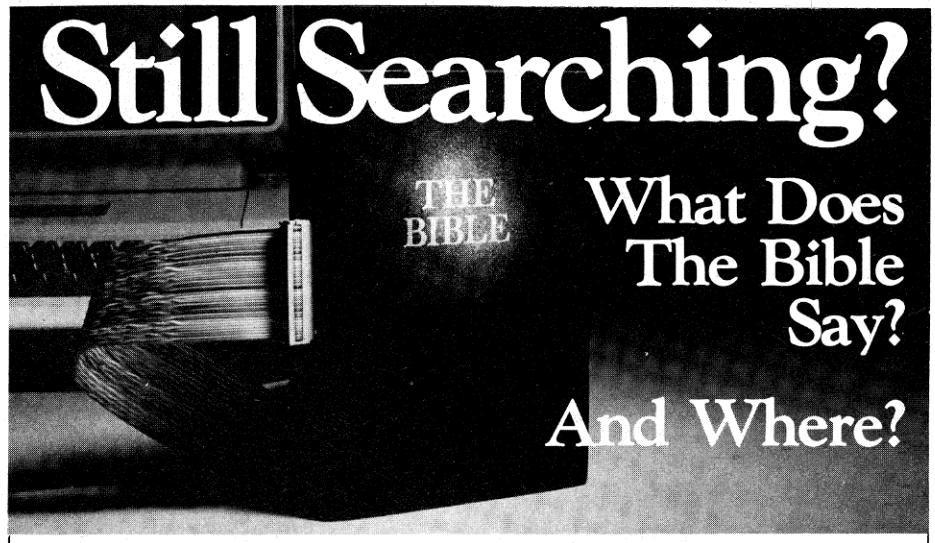

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DAT, on disk in ASCII. Once again I used FLEX's Append to merge them, renaming the joint file NEWCCW. Finally, I saved both ASCII and tokenized versions of NEWCCW.

Both versions loaded and ran normally under DBASIC, although the actual loading processes took longer for the FLEX version. I assume that this has to do with the way FLEX allocates the 256-byte sectors where programs are stored. The difference in storage formats seemed to confuse CCW's ability to calculate the free space remaining on the disk, as well. Outside of this, I detected no bugs in the program's operation. I was able to use FLEX to examine text files produced by NEWCCW just as for the Radio Shack checkbook program.

The bottom line, then, is that even though DBASIC's disk I/O is actually handled by FLEX utilities, you rarely need be concerned with the fact. Incidentally, DBASIC will also read Color Computer machine-language cassette programs. There is no compatibility for machine-language disks, however.

Converting Your Old Basic Programs

Earlier I mentioned the RTF program, which converts ASCII files stored in Radio Shack's Color DOS format to similar files that can be read by FLEX. This is the tool to use if you have Color Disk Basic programs that you would like to run under DBASIC.

RTF itself is loaded from DBASIC. The Run command brings up a four-item menu, giving you the option of listing a directory for a Radio Shack or FLEX disk, copying from Radio Shack to FLEX format, or returning to DBASIC. The copy option prompts you for the numbers of the drives holding the two disks (these can be the same) and the name and extension of the original file. Next, you insert the source disk in the drive. After it is read, you receive a prompt that identifies the starting gran (in decimal and hex, no less) and asks you to insert the destination (FLEX) disk.

Hitting the enter key starts the conversion process. The file is listed on screen as the conversion proceeds. Large files have to be copied in several stages, but this is no problem as RTF prompts you to switch disks as needed. After completion of the process, an "All Done" message appears on the screen. If you now examine the directory of the FLEX disk, you will find your converted file, old extension and all. Again, since this will be an ASCII file, it can be manipulated by FLEX utilities.

"Incidentally, DBASIC will also read Color Computer machine-language cassette programs."

A Bug and Its Cure

While most of DBASIC's operating characteristics are quite benign, I did encounter one bug. There is a pretty simple fix, though, and something of a surprise twist to the whole affair.

The bug appeared when I tried to use the graphics commands of Extended Color Basic. Whenever a graphics screen was called up, the desired display appeared on about the ninth line of the screen preceded with eight lines or so of garbage. The top of the graphics was there, but it was displaced downwards from its rightful position. Of course, this meant that about eight lines of desired material were lost from the bottom of the screen.

The nature of the undesired stuff varied, depending on whether or not any programs had been run before the graphics commands were used. At various times, I saw square wave patterns, circular arcs, and isolated dots. The background of the garbage screen was always the correct color as defined by the Color Basic commands. Text displays were not affected; PRINT@0 put a character at the extreme upper left corner of the screen, just as it should.

I discussed this with Frank Hogg and Tom Speer, the author of DBASIC. Their first opinion was that the problem lay with FLEX's file control blocks, which can cause a DBASIC graphics display to begin at locations other than a 256-byte page boundary, contrary to the rules of Extended Color Basic. The fix that they recommended was inserting a FILES 1 or FILES 3 command in a program anywhere ahead of the commands that call up graphics. These Files statements reserve more or less buffer space than the default of two buffers, and thus move the start of the graphics RAM. This works perfectly well.

The Files statements can also be entered from the command mode before your program is run. The command mode is especially useful for FILES 3, which halts execution if included in a program; this has to do with reserving more space than the default. Having to enter Run twice to get a program running can be an annoyance.

If you want to write programs requiring more than three buffers, 'FILES n' also takes care of the graphics bug if one of the following values of n is used: 6, 8, 9, 11, or 14.

A few days after I brought this matter up, Frank Hogg informed me that the same bug occurs in Disk Color Basic itself—the numbers are just different! Sure enough, the same effects do crop up, and for the same general reason. For the record, you can get clean graphics in Disk Color Basic for the following numbers in a Files statement: 2, 5, 7, 9, 11, and 13.

Summary

DBASIC is evolving along with the Color FLEX DOS. My copy of FLEX was version 5.0, but by the time this review appears, purchasers will be receiving version 5.0:1. The difference is that 5.0:1 uses software-defined text screens giving 24 lines of either 51 or 64 characters, like Martin Consulting's Colorterm intelligent terminal program. This affects the way in which DBASIC must store and piece together code from the Basic ROMs. Hogg Labs promises to keep track of changes, though, so the DBASIC shipped at any time will be compatible with the contemporary version of FLEX. Future versions may even cure the graphics bug once and for all.

Other than the restriction to sequential files, DBASIC imposes no particular restrictions. Most programming tasks can be carried out just as for Extended Color Basic, with the added advantage of having I/O files that can be examined and manipulated outside of their parent programs.

The language is of dubious value if you are not interested in reading and writing disk data files, but then FLEX itself has little to offer if you are only interested in writing totally self-contained Basic programs. If you are seriously contemplating stepping up to FLEX, however, DBASIC is a reasonably priced addition to your programming library. ■

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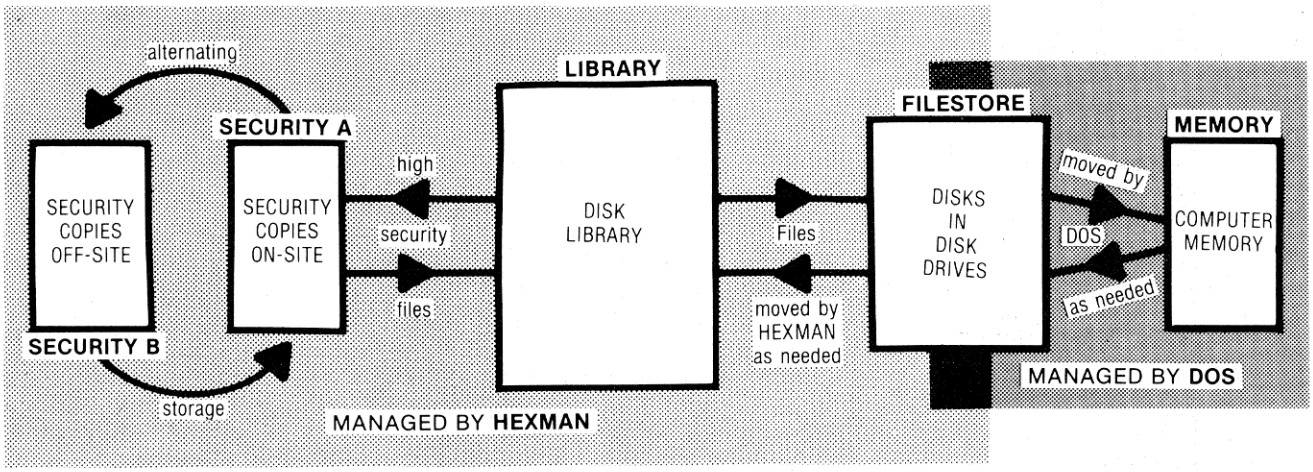

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Only a small portion of your disks can be in your disk drives at any one time. These disks form the "Filestore" to which your computer has immediate access, and the remaining disks form your disk "Library". Ideally the "Filestore" should contain the most active files, while inactive files are kept on "Library" disks stored near the computer.

HEXMAN comes as close to this ideal as it can by monitoring file activity and keeping the most frequently used files in the Filestore. If previously inactive files are needed, they are moved in from the Library. If the Filestore becomes full, the least active files are moved out to the Library. The net result is the files you are most likely to use are ready and waiting.

HEXMAN also performs other storage management chores such as daily backups of modified files, on-site and off-site storage of security copies, and file growth monitoring.

File Retrieval

HEXMAN manages up to 8000 files (2000 originals with up to 4 copies of each). If remembering that many eight letter file names gives you a headache — don't worry. HEXMAN gives you two easy ways to find the files you need. With HEXMAN you find files by function e.g. "Get all the files I need for the end of month Sales Reports" or by description e.g. "Find the letter I sent to Radio Shack about my disk drives". HEXMAN finds your files in seconds. Once you have found them you may Review them, Load them or Delete them as needed.

Requirements

Model III — 48K, 2 drives.

Model I — 48K, 2 drives. Double Density adaptor. Lower case modification.

LDOS operating System. If you do not have LDOS, please add $35 for a copy of the smal-LDOS operating system.

$169 US

90-day trial - just $20.

We are sure HEXMAN will become a "must have" program for all serious TRS-80 users. But check it out for yourself. Purchase HEXMAN now and try it out. If you feel you can live without it (unlikely!), return it for a prompt refund less a $20 evaluation charge.

Offer valid for direct sales only - dealer terms may vary.

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This product is timelocked. Unregistered copies will expire at a future date. Registered owners will receive an extension patch when needed.

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46

See List of Advertisers on Page 387

★★★

Ultra-Term
Don Burgan
United Software Associates
North Palm Beach, FL 33408
Models I & III
$59.95

by Stewart E. Fason

The Ultra-Term smart terminal package is running my new direct-connect, auto-answer modem and I couldn't be happier. It is easy to operate—you need no arcane knowledge to run the program.

Features

With Ultra-Term, you can transmit and receive files without converting them to ASCII (if Basic) or hex (if machine language). Because other terminal programs may demand files be sent in ASCII or hexadecimal, two programs included in the package will automatically convert a file so that it can be sent to any system, and convert a file received in hex back to machine language.

It is compatible with all major operating systems: TRSDOS, NEWDOS, DOSPLUS, LDOS, and MULTIDOS.

Ultra-Term lets you receive an unlimited number of files while unattended, as long as the computer sending data is also using Ultra-Term. When two computers using Ultra-Term are talking, they can send files just as they are on disk. This method is usually faster than using ASCII or hex—converting one byte of a machine-language file to hex requires two bytes, and a compressed Basic file converted to ASCII will be about 30 percent longer. Furthermore, the size of the file transmitted is limited only by the size of the disk, rather than by the buffer size at each end. Ultra-Term also verifies every bit to ensure accuracy.

It lets you set your RS-232 parameters to conform with the system on the other end. Most bulletin boards use 300 baud, 7-bit words, one stop bit, and even parity. Compatibility is no problem among TRS-80 owners, but I often talk to IBMs, Apples, Commodores, Burroughs, or who knows what. If they can't use my RS-232 settings, I must be able to use theirs.

Ultra-Term automatically dials preprogrammed telephone numbers, or one that the operator enters through the modem. It lets a colleague on the west coast access my computer long after I have left for the day. He can use my system (with some limitations) as though he were at my keyboard. He can upload, download, and leave messages (which can be password protected).

The package lets you turn the printer on or off by pressing three keys simultaneously. It has a 1K buffer, which makes life easy for slow printers.

When the operator on the other end sends an ASCII bell (control G, hex 07), a tone comes through your cassette port. If you have an amplifier hooked up, the other end can signal you with audio at any time.

Ultra-Term lacks some frills—it has no auto-log-on and you can't modify control characters, for example. Don't expect a fancy leather-bound notebook containing the disk and documentation. The manual is only eight pages long, but as I've said, the program is simple. For $59.95, you can't beat it. ■

★★★★

Doughflo
Alphanetics
P.O. Box 597
Forestville, CA 95436
Model I and III, disk system
$79.95

by Bruce Powel Douglass

Until I received Doughflo, my checking account *never* balanced. But as my business began to grow, I needed to know where my money was going, and where it was coming from. How much do I spend on computer equipment? Software? Office supplies? Women? A hand accounting system is just not the way to go.

Doughflo from Alphanetics is the program that solved all my accounting problems. My accounts balance to the penny and I have monthly records of all my financial dealings. Thirty-three categories for income and expenditures define my subtotal categories, such as personal costs, equipment costs, business costs, taxable income, and total expenses. With Doughflo, I not only keep track of the final balance, but I can easily and quickly see where my everyday expenses lay.

Doughflo is a convenient way to solve a variety of common income and expenditure analyses, tax preparation, and bookkeeping tasks; this is true for both the household and for the small business. For the household, it is an excellent bookkeeping system; for the business, it is simply the easiest way to keep track of your income and expenses.

Doughflo requires at least 32K RAM and one disk drive. It comes on three disks for the Model I and two disks for the Model III. There is a large ASCII file of instructions and two identical copies of Doughflo, in case one copy gets zapped. Sample data files are also enclosed and these are used in the manual to show the workings of Doughflo.

My version of Doughflo cannot be backed up and only works in single density for the Model I, but by the time you read this, Doughflo will be unprotected by Alphanetics, allowing you to use your favorite operating system and even double density.

I dearly love Doughflo, but there are a couple of small points that I dislike about the system. First, the manual is not particularly outstanding, and it is not provided in a printed form—it is supplied on disk. You must route it through your own printer. It would be difficult to read the manual by listing it to the screen and pausing the listing with shift @, but it can be done. It would be much more convenient to supply a printed manual.

In terms of content, the manual is helpful but lacks referencing (such as a table of contents or an index). Fortunately, a cursory reading of it is all that is necessary to use Doughflo, because the program itself is menu-driven.

You can configure Doughflo using the CATGEN option from the main menu. The default is to use only one drive, requiring you to switch your program and data disks frequently. If you configure it for a multiple-drive system, Doughflo stores this on the program disk, and you are not required to switch disks.

CATGEN also lets you create your categories and set up the reports generated by Doughflo. Various categories can be summed in any order and the results labeled for meaningful presentation, either to the screen or the printer. You can define up to eight such subtotal reports. The system I set up is shown in

TONIGHT ON YOUR TRS80

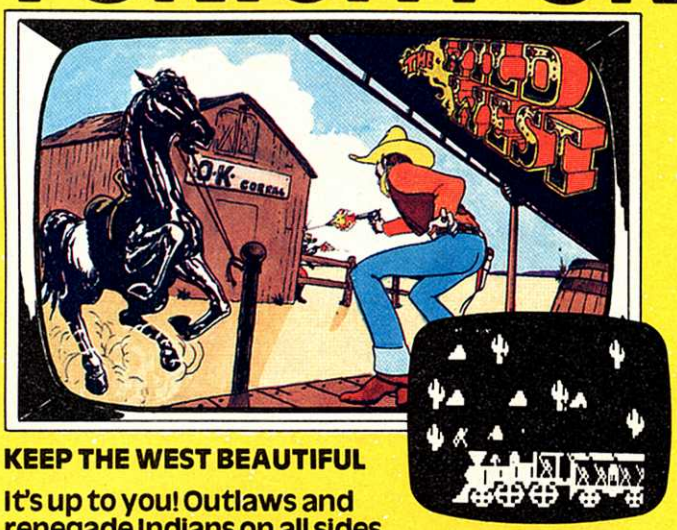

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Table 1.

When I enter the checkbook, receipts, and so on, into this program, I assign each expenditure or income into one of these categories. I can then print out monthly totals for each column, the percent of each of these categories is of total income, or total expenses. The grand total is printed for the all expenses and all income as well, and the net profit/loss (the sum of the total expenses and total income).

Other reports can be defined. For example, the subtotal category Personal Costs is defined to be the sum of categories N, O, P, Q, R, S, and T. Equipment costs are the sum of C, D, E, and F. You can easily define these subtotal categories as the sum of the primary categories as flexibly as you wish. It is the perfect tool to see who your money is running off with, or which accounts yield the largest profit margin after expenses are subtracted.

Entering the data is easy. To protect your files as much as possible, the data files are chosen by you and then dumped into an intermediary file. All work is done with this file. When you are done processing, you can save the contents of the intermediary file into permanent file storage.

Expense Categories

A Gas and Electricity
B Postage
C Office Supplies
D Computer Hardware
E Computer Software
F Miscellaneous Equipment
G Reference Materials
H Phone Bills
I Printing Costs
J Advertisement Costs
K Media Costs
L Insurance
M Rent
N Auto Insurance
O Personal Insurance
P Eating Out
Q Groceries
R Savings
S Auto Maintenance
T Miscellaneous Expenses

Income Categories

1 Deposits
2 Magazine Writing
3 Book Writing
4 Manual Writing
5 Program Royalties
6 Job Income
7 Nontaxable Income

Table 1. Sample Expense and Income Categories

"...Doughflo will soon be unprotected by Alphanetics..."

The permanent files are arranged by months. You can have more than one month in the intermediary file, so you can do bimonthly, trimonthly, or even yearly reports just as easily as monthly reports. When you load in the intermediary file for inputing data, you will see the last record read in. For example,

```
Entry Number.....254        Date 03/31/82
Category Receipt/CK# Name Description Amount
   Z     C30332*     Mastercard      $-500.00
```

This is the standard data display screen. The entry number tells you where the entry occurs in the intermediary file. The data is the date given to the record. The category assigned to the entry tells the type of expense/income it is. The Receipt/Ck# is for further identification of the entry. For checkbook balancing, this is the check number, or deposit slip number. The C in this column tells Doughflo automatically that this is a check. The * tells that the check has been entered but not yet cleared by the bank. The Name/Description column lets you say to whom the check was written and for what purpose, or to identify the entry further. The amount is negative because it is a check, hence money leaving your account. The entry is assumed to be negative (even though you don't enter a minus sign) unless a plus sign precedes the amount.

You can edit a file by deleting entries, adding entries, or editing an entry. You have full editing capabilities for each column in the record, so you can easily alter the date, amount, whether the check has cleared, or whatever. You can display records in several ways. You can Seek an entry by entry number and display it in the same format as above. To display the next entry, press the N key, or press P to display the previous entry. Press the F key to scan forward and the R key to scan in reverse. The entries are displayed one after the other (in the direction requested) until the last entry is reached or the first entry is reached, or you tell it to stop.

Pressing B causes the program to compute a balance up to the current entry. You are asked for the beginning entry. If you press the enter key, the first entry is assumed. A balance is calculated by adding up all the amounts. The result looks something like Table 2. After this, you can save the file to disk or not, when you exit to the menu.

From the main menu, you can sort by category, date, name/description, or receipt/check number. You can sort all permanent files, or the intermediary file. You can save the intermediary files into the permanent monthly files. This option searches through the intermediary file and puts the various entries into the monthly files in which they belong.

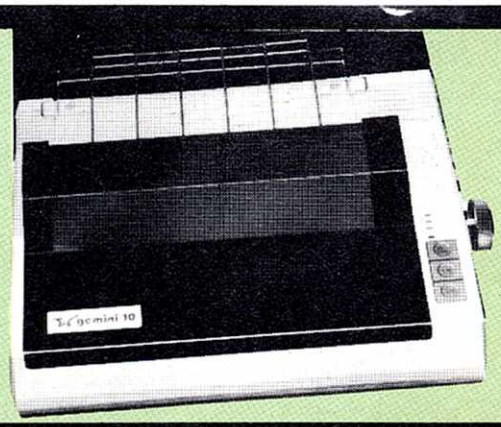
Doughflo's report generation is very good. The output may be sent to the printer or to the video screen. Doughflo assumes 66 lines per page, and cannot be used to output escape sequences to change the printer's font. If you are content with standard formatting, Doughflo is quite adequate. It supplies two top titles with your title name and the date ranges for the report. The summary report generates the grand totals for each category and the percentage each category total is of total expenses and total income. The summing report generates similar information for each of your subtotal categories.

Doughflo is an excellent income/expense analysis program. It will tell you where your money goes and where it comes from. ■

ENTRY NUMBER.... 10 DATE 01/08/81

CATEGORY	RECEIPT/CK#	NAME/DESCRIPTION	AMOUNT
U	M0108	WINDOW WASHING	$ -10.00
2 INCOME	$ 500.00 :	CLEAR CHECKS	$ -400.00
3 CREDIT	$ 500.00 :	+ TOTAL BANK DEPOSITS	$1000.00
4 NOT INC.	$ 100.00 :	= BALANCE	$ 600.00
5 NOT INC.	$ 200.00 :	UNCLEAR CHECKS	$ -200.00
6 EXPENSE	$-400.00 :	TOTAL OTHER INCOME	$ 500.00
7 EXPENSE	$-100.00 :	OTHER EXPENSES	$ -110.00
8 CREDIT	$ 99.99 :	GRAND TOTAL EXPENSES	$ -710.00
NOT INC EXP	$ 300.00 :	.....	
NOT INC CRD	$ 599.99 :	G.T. INCOME + EXPENSES	$ 790.00

Table 2. Sample Balance Table



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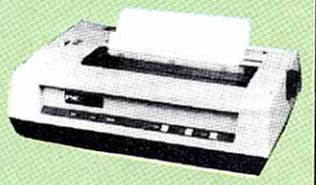
630 Tractor	$314.88
DMP-85 Printer	$469.88



The "generic" version of the NEC & Prowriter. Features 120 cps, bi-directional, logic-seeking print action. 9 pin printhead produces 4 fonts (including proportional), 8 sizes, subscripts, superscripts, underlining & Greek/math fonts. Dot-addressable graphics matrix is 160 x 144 dpi, with 1/144" line feed. Friction & tractor feed is standard (takes 9½" width paper).

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MODEMS

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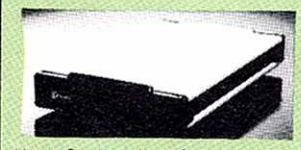

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by Jake Commander

Many TRS-80 owners might argue that the machine's single greatest weakness is its inability to display high-resolution graphics. Whereas many micros can boast a resolution of 256 by 192, the TRS-80's graphics performance of 128 by 48 looks puny by comparison. True, even these 6,144 pixels can be made to do some fascinating work, but it's usually a case of speed fooling the eye into not noticing the ragged, stepped edges of such poor resolution.

If you've drooled enviously at the Mikee Graphics advertisements, here's a chance to see how it performs in real life.

The Mikee Graphics Board from the Mikee Electronics Corporation offers a hardware option to upgrade the graphics of the TRS-80 from third to first class. After installing the board in the keyboard unit, you can hook up an extra module to allow resolutions of 384 by 192 on a Model I or a massive 512 by 192 on a Model III. That's 73,728 and 98,304 dots respectively!

With this kind of resolution, many more serious tasks in the realm of computer-aided design and management (CAD/CAM) can be undertaken. What makes it even more effective is that the graphics can be intermixed with text to allow labeled diagrams and the like. A demo program supplied with the package amply demonstrates its many features. In addition to the normal low-resolution graphics, the system allows high-resolution graphics of 384 by 192 on the Model I, 512 by 192 on the Model III, or medium-resolution graphics of 192 by 192 on the Model I, and 256 by 192 on the Model III (all in combination with inverse video).

Mikee Electronics has opted for a memory-mapped video display similar to the normal TRS-80 system. Whereas normal video is mapped from 3C00 to 3FFF hex, the Mikee video is mapped from C000 to EFFF hex. That's 12K of RAM at the top of memory, making the TRS-80 memory map look like Fig. 1.

Notice that in a 48K system, the top 4K is untouched by the Mikee system but the 12K immediately below it is commandeered for the medium- and high-resolution graphics. This works out very conveniently for maintaining software (such as driver routines) that may use the top RAM in your system. If you have less than 48K, your resident software will be below the Mikee Graphics RAM anyway. If you do have 48K then you retain the use of your upper 4K for high-RAM software—this is more than adequate under normal circumstances.

The 12K that's set aside for high resolution is flipped in with a port output command. In fact, all options in the system are selected by this method, with port 254 (hex FE) being the control port. Four output bits are used to select any or all appropriate combinations of the following options:

Bit 7—Select Mikee Graphics RAM (12K)
Bit 6—Select mid-resolution mode
Bit 5—Select normal TRS-80 graphics
Bit 4—Select inverse video

I would have prefered another port than 254, as this is already a de facto standard for the control of most high-speed clock modifications. This has to be accounted for by using bit 0 (which controls the high or low clock speed) along with the four control bits outlined above.

It's a simple matter to mix text with high-resolution graphics in much the same way as with low-resolution graphics. Under normal circumstances on an unmodified TRS-80, any byte placed in video RAM that has a value less than 128 is displayed as a character. The shape of this character is fetched from a character-generator ROM that is preprogrammed to generate the appropriate shapes according to the ASCII char-

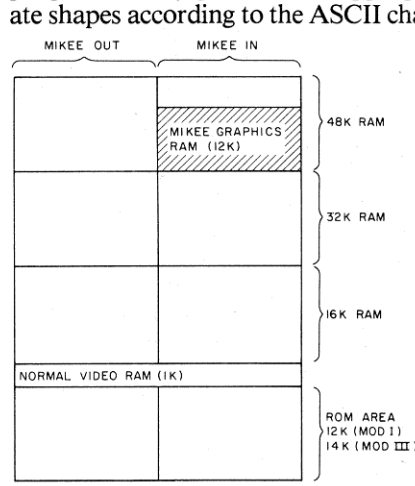

Fig. 1. The TRS-80 Memory Map

acter set (plus a few extra on the Model III). However, when the byte in video memory has a value between 128 and 191, the displayed shape is no longer fetched from the character generator ROM. Instead, a system called "bit-mapping" comes into play. On the TRS-80, the lower six bits are taken from the display byte and loaded into a shift register. As the electron beam scans down the face of the screen, each bit is displayed in a carefully synchronized sequence as a white point if it's a 1, or a dark point if it's a 0. Each of the six points controls a particular pixel, hence the term "bit-mapping."

The Mikee Graphics system detects all bytes that are graphics characters and (ignoring the normal six graphics bits) uses its own method of bit-mapping the pixels. So if the normal TRS-80 video RAM is filled with graphics characters (they would normally be dummy graphics blanks), the whole of the screen will be given over to the Mikee bit-mapped graphics. However, if you throw a letter A into normal video RAM, it will switch out Mikee at that character position and display the correct character generator shape. This neat touch does away with the need to generate ordinary text from the bit-mapped pixel graphics—exactly what you have to do on the Color Computer if you want text in high-resolution display mode.

Apart from text generation, the graphics are pretty logical. Any bit set anywhere in the 12K of Mikee Graphics RAM lights any one of the 73,728 or 98,304 points on the screen (according to Model I or III use). It's as simple as that.

So much for the theory. What about the practical aspects of receiving and installing the package? Well, the system comprises a small printed-circuit board that fits inside the keyboard unit and attaches via a multi-way connector to the main graphics unit (a small gray box).

You're also supplied with an installation and instruction manual...and a magnifying glass! No, it's not for small print—the manual is exceptionally clear and contains numerous photographs illustrating step-by-step installation instructions. Separate sections cover Model I and Model III installations, and some software examples help you get the thing into action.

The magnifying glass is to help you check your soldering for any bridges or solder balls. As you have to make 15 soldered connections, a thorough checkout with the glass makes rather good sense. Not only that, but when you've finished the subsequent computing session, you can start collecting butterflies.

A tool kit is available from Mikee Electronics for those people who've never dabbled with a soldering iron, but if you have no previous soldering experience, get somebody else to install it—soldering to integrated circuit pins can become a tragic mess to a beginner. The unit is easy to install, though, and worked the first time on my Model III.

Criticisms

I have a couple of small gripes, but they're far outweighed by the excellent performance of the system. I've already crabbed about the use of port 254 as the control port. This could be a minor nuisance if you have a high-speed clock.

When you turn the system on, it doesn't default to normal TRS-80 graphics. It's necessary to output to port 254 to set the computer to its standard display mode. I think this is a disadvantage.

I can thoroughly recommend Mikee Graphics to any Model I or III owner with a need for high-resolution graphics. ■

* * *

Microbuffer
Practical Peripherals, Inc.
31245 La Baya Drive
Westlake Village, CA 91362
Epson MX-80 and 100
$159

* * *

MXPLUS
Dresselhaus Computer Products
Box 929
Azusa, CA 91702
Epson MX-80 and 100
$49.95
by L. W. C. Dye

When the Epson MX-80 arrived about two years ago, it rapidly pushed established printers aside and captured about 40 percent of the small-printer market. However, with the rapid advances in technology, it seems that whatever we buy today is obsolete tomorrow. The Microbuffer and MXPLUS are two products that will make your Epson perform as it never

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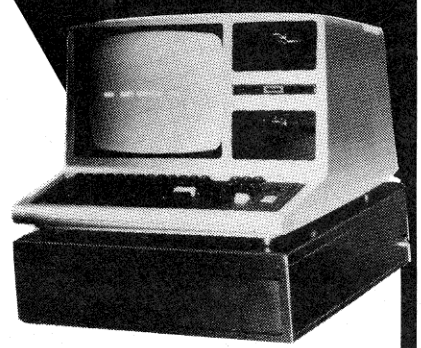

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did before and make a new printer seem less attractive.

The Microbuffer

The Microbuffer comes in two versions—the serial MBS-8K and the parallel MBP-16K. The parallel version is Centronics compatible, buffers 16,000 characters, and replaces the standard Centronics interface on the Epson. The serial version buffers 8,000 characters and supports both hardware and software handshaking at speeds from 300–19,200 baud. The 8K buffer on the serial version was probably a space limitation because the RS-232C components fill the majority of the board.

Both versions are built on high-quality PC boards. There is one socketed ROM on the board and all other components are soldered. The installation instructions are thorough and clear. Although my board slipped right in, the instructions point out some possible tight spots due to minor variations in the Epsons and how to handle them.

My printer and my computer were flying now and running faster at 4,800-baud serial than they had been running parallel. The buffer was soaking up the lines and freeing the computer as fast as it could transmit. Unless I was sending a lot of graphics over the cable, the computer could get ahead of the printer and the buffer would slowly fill. When it does get full, the computer must again wait for the buffer to empty enough to get another line in but the computer will always stay 8K to 16K ahead of the printer.

To illustrate the speed difference, I ran four tests with both the Microbuffer and an unbuffered Epson serial interface board. The first test was printing a 6,380-character text file with my word processor with right-justification and emphasized print turned on. The second test was the same text file but with right-justification and emphasized print turned off. The third test was an LLIST of the 13K word processor itself. The last test was an LLIST of a small 2.5K program that could not fill the buffer.

The Epson normally prints at about 80 cps, but slows down to about half that when printing emphasized or double strike. The word processor goes through additional work for the right-justification and needs more time to get a line ready.

Table 1 shows the results of these tests. In every test with the Microbuffer, the computer was done before the printer and was available for more work. Using the unbuffered serial board, the computer and printer always finished together so only one time is shown. The print time improvement is dramatic for the Basic word processor, but minimal for the LLIST's. However, the computer is freed up earlier in all cases. Note that the buffer filled about 45 seconds into the 13K LLIST but the computer was still freed up three minutes earlier than it would have been.

The MXPLUS is another PC board add-on for the Epson. To install it, you remove the 1B ROM and plug it into the MXPLUS board. The board is then plugged into the 1B socket and one connection is made to the 3C chip with a test clip. The instructions are clear but the installation is very tight and the board could be made a little smaller. It takes a little juggling with the test clip on 3C to get a good connection and ensure that it is not shorting out another pin. The MXPLUS board ends up under the Microbuffer, but there is adequate clearance.

The MXPLUS contains firmware programming to give you hardware control of many of the Epson, Graftrax, and Graftrax+ functions. The on-line, form-feed, and line-feed buttons are your controls and a small sticker is supplied as a reminder of the nine functions provided. They are:

- Reset All Functions
- Condensed Print
- Double Wide Print
- Emphasized Print
- Double Strike
- Perforation Skipover
- Italics (with Graftrax)
- Indentation
- Eight lines per inch

MXPLUS is activated by pressing and holding the on-line button until the Epson beeps. The on-line light will blink in a short on, long off pattern if none of the functions are turned on. This is also the reset function, and a press of the form-feed button will turn all functions off.

Each additional press of the on-line button will take you to the next function. If the on-line light is in the short on, long off pattern, the function is off. If the pattern is long on, short off, the function is on. The functions are toggled on and off with the form-feed button. You can quit at any time by pressing the line-feed button to escape and then the on-line button to ready the printer.

Emphasized print will still override condensed print just as on a normal Epson, but in general, you can mix software and hardware control. Hardware-selected wide print will not turn off at the end of each line, however. Perforation skip prints 58 lines then skips eight for LLISTs and such. It should be turned off if pagination is under program control. Indentation moves the left margin in six spaces to allow three-hole punching or binding, but if a line wraps, the continuation is not indented. The eight-lines-per-inch function also resets top-of-form except with Graftrax+.

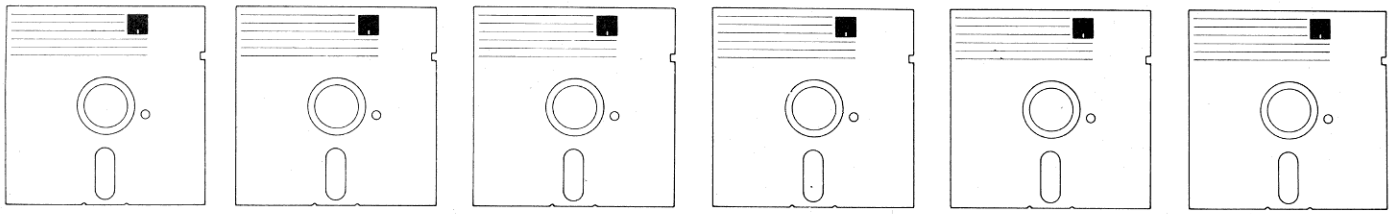
With MXPLUS, I can now print documents in double width, condensed print for that bold look. Since you can stop the printer and switch modes at any time, changing type styles in the middle of a document without inserting control codes is possible.

The only problems I found were the lack of indentation on wrap-around lines and that the first character on a double-width wrap around will be single width—minor problems indeed compared to the features added.

Both the Microbuffer and the MXPLUS are good "value added" modifications to the Epson that add features to an already excellent product and save you some time, too. ■

Tests at 4800 baud	Buffered Time Computer	Buffered Time Printer	Unbuffered Time Both Done
6K Text—Justified and Emphasized	2:35	4:06	6:05
6K Text—Regular unjustified	2:05	2:38	4:05
13K LLIST	1:44	4:59	5:01
2.5K LLIST	0:09	1:17	1:18

Table 1



REVIEW DIGEST

Computers for Everyone, Jerry Willis and Merl Miller, Dilithium Press, Beaverton, OR, $6.95, soft cover, pp. 262.

"Despite its annoying tone, I would recommend this for people who know little or nothing about computers and don't mind sifting through the verbosity and corny jokes. It can be a relatively painless way to learn the basics. It is loaded with useful information and has illustrations that are both amusing and informative." *Classroom Computer News*, October, p. 64.

PDS (Partitioned Data Sets), Misosys, 5904 Edgehill Rd., Alexandria, VA 22303, Model I or III, LDOS, $40.

"Basically PDS is a file on a disk that itself contains subfiles. . . . It is a sophisticated utility for a sophisticated audience. It is an excellent complement to the file-handling procedures already found in LDOS, and will find particular application by users who have large disk-storage problems." *InfoWorld*, November 29, p. 100.

Beta-80, MECA, 56677 Sunset Ave., Yucca Valley, CA 92284, Model I, $699 single density, $849 double density.

"I was bound and determined to find effective mass storage at low cost. I pored over computer journals for months before I learned about a small company in California called MECA. They had just started production of a digital-cassette storage device called the Beta-80, which was designed to interface directly with the TRS-80 Level II. I have owned my Beta-80 for well over a year now, with no more than a handful of lost bytes." *80 U.S. Journal*, December, p. 100.

El Diablero—An Adventure Game, Computerware, Dept. C., Box 668, Encinitas, CA 92024, Color Computer, $19.95 cassette, $24.95 disk.

"Your 'situation' in El Diablero is that you awake, dazed and confused, in the middle of the desert. . . knowing that you have been learning the techniques of sorcery from an old man in these parts. The problem is that you can't remember anything you have learned, and you can't find the old man. You must learn to use this 'magical' power. . . another excellent game from Computerware." *'68' Micro Journal*, November, p. 14.

DiscatER, softERware, 16007 Miami Way, Palisades, CA 90272, LDOS, Model I and III, $39.95.

"Although DiscatER is a floppy-disk-cataloging program, it actually keeps track of each file on the disk. . . . This is an extremely functional product at an excellent price. DiscatER is simple enough to be used by people with minimal computer proficiency. . ." *InfoWorld*, November 15, p. 49.

Madam Rosa's Massage Parlor, The Softcore Software Co., 9 Southmoor Circle, Kettering, OH 45429, Color Computer, $15.

"Madam Rosa's Massage Parlor falls far short of all expectations (whatever yours may be) and it's not even a very good adventure. It was written on the level of a slightly voyeuristic 15-year-old recluse without the deviousness one would expect for $15." *Rainbow*, November, p. 66.

Outhouse, Soft Sector Marketing, 6250 Middlebelt, Garden City, MI 48135, Model I or III, $15.95 cassette, $19.95 disk.

". . . what we have here is a game that is fast and funny. But is it a good game? I have played a few fast action games that just did not appeal to me. Fortunately, Outhouse is not one of these. There are enough different types of aliens to give the game variety and hold your interest. There is enough variance in speed to give a seemingly endless challenge." *80 U.S.*, December, p. 101.

Color Fan, Atomic City Electronics (Atomtronics), 3195 Arizona Ave., Los Alamos, NM 87544, Color Computer, $34.95.

"Most readers. . . are aware of the power supply and heat problems of the Color Computer, and have seen several of the published 'fixes'. Atomtronics has now come up with a 3″ cooling fan for the Color Computer that is easy to install and will help alleviate some of these problems. . . . This is a product that we have needed for the Color Computer for a long time, and will greatly extend the life of parts and pieces in the computer." *'68' Micro Journal*, November, p. 15.

Roman Checkers, Tandy/Radio Shack, Radio Shack Stores, Color Computer, $29.95.

"Don't let the name fool you. Roman Checkers is Radio Shack's version of the popular board game, Othello. This RS product is a surprisingly clever rendition of the board game that uses 'reversible discs'." *The Rainbow*, November, p. 55.

CALENDAR

February

5 **Computer Swap America** Santa Clara County Fairgrounds, San Jose, CA.

7–9 Technical Education Research Centers, Cambridge, MA. **Microcomputers in Education** Washington, DC.

14–17 IEEE Computer Society, Silver Spring, MD. **Computer Science Conference** Orlando, FL.

16–18 IEEE Computer Society, Silver Spring, MD. **International Solid State Circuits Conference** New York, NY.

16–18 TALMIS, Oak Park, IL. **3rd Annual Software Publishers and Computer-Based Training Conference** Ambassador West, Chicago, IL.

17–19 Technical Education Research Centers, Cambridge, MA. **Microcomputers in Education** New York, NY.

18–21 **2nd Annual Pacific Computer Expo** Convention and Performing Arts Center, San Diego, CA.

21–23 American Federation of Information Processing Societies Inc., Philadelphia, PA. **Office Automation Conference** Philadelphia Civic Center.

23–25 Future Computing Inc., Richardson, TX. **Personal Computer Retail Forum** Loews Anatole, Dallas, TX.

March

1–3 IEEE Computer Society, Silver Spring, MD. **COMPCON Spring '83** San Francisco, CA.

8 IEEE Computer Society, Silver Spring, MD. **MICRODELCON** Newark, DE.

10–12 The Council for Exceptional Children, Reston, VA. **Use of Microcomputers in Special Education** Hartford, CT.

14–15 Michigan Association for Computer Users in Learning, Wayne, MI. **MACUL '83** Dearborn, MI.

16–18 IEEE Computer Society, Silver Spring, MD. **16th Annual Simulation Symposium** Tampa, FL.

17–19 Arizona State University, Tempe, AZ. **Microcomputers in Education** ASU campus.

18–20 **West Coast Computer Faire** Brooks Hall, San Francisco, CA Civic Auditorium.

25–26 **1983 Small College Computing Symposium** St. Olaf College, Northfield, MN.

29–31 IEEE Computer Society, Silver Spring, MD. **Workshop on Computer System Organization** New Orleans, LA.

April

4–8 IEEE Computer Society, Silver Spring, MD. **Tutorial Week East '83** Orlando, FL.

6–8 IEEE Computer Society, Silver Spring, MD. **1983 International Optical Computing Conference** Cambridge, MA.

10–13 Association for Computing Machinery (ACM)/SIGAPL, Washington, DC. **APL83** Sheraton Washington Hotel.

17–22 **Infocom '83** Town & Country, San Diego, CA.

25–27 IEEE Computer Society, Silver Spring, MD. **1983 Symposium on Security and Privacy** Claremont Hotel, Oakland/Berkeley, CA.

Coming Next Month

The March issue of *80 Micro* will feature several you-can-build-it hardware projects. Topics include a $5 CP/M modification for the Model I, an audio amplifier, a guide to constructing an EPROM programmer, and computer security with a credit card. We'll also have a cassette operating system and the first installment of a Lisp interpreter series.

Our new Color Computer column will make its debut. Called The Color Key, it's authored by Scott Norman.

Model II owners will find a special surprise beginning in March. Each month, we'll print conversion tables for a few Model I/III programs to make them usable on the Model II.

In Fun House, Richard Ramella introduces an adventure game that players can customize with names they choose for characters and locations. ■

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VERSALEDGER II™ is a complete accounting system that grows as your business grows. VERSALEDGER II™ can be used as a simple personal checkbook register, expanded to a small business bookkeeping system or developed into a large corporate general ledger system **without any additional software.**

- VERSALEDGER II™ gives you almost unlimited storage capacity (300 to 10,000 entries per month, depending on the system),
- stores all check and general ledger information forever,
- prints tractor-feed checks,
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- prints 17 customized accounting reports including check registers, balance sheets, income statements, transaction reports, account listings, etc.

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Checkbook Maintenance.....Accounts Receivable.....Accounts Payable.....

BUSINESS 100 PROGRAM LIST

NAME	DESCRIPTION
1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEPLETE	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPROF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUOQ	Fixed quantity economic order quantity model
53 FQEOWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project
59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertable bond
100 PORTVAL9	Stock market portfolio storage-valuation program

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Form **1040A** Department of the Treasury—Internal Revenue Service **U.S. Individual Income Tax Return** **1982** (0) OMB No. 1545-0085

Use IRS label. Otherwise, please print or type.	Your first name and initial (if joint return, also give spouse's name and initial)	Last name	Your social security number
	Present home address (Number and street, including apartment number, or rural route)		Spouse's social security no.
	City, town or post office, State and ZIP code	Your occupation ▶ / Spouse's occupation ▶	

Presidential Election Campaign ▶ Do you want $1 to go to this fund? . . . . . Yes ___ No ___
If joint return, does your spouse want $1 to go to this fund? . . . Yes ___ No ___

Note: *Checking "Yes" will not increase your tax or reduce your refund.*

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TRS-80* Owners Do Your Own Taxes Like An Expert with TAX/SAVER II™

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TAX/SAVER II™ — The tax help program for the layman, the professional accountant or tax preparer.

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TAX/SAVER II™ also has speed features for those doing more than one return. Optional program instruction and tax text make TAX/SAVER II™ the practical system for professional preparers as well. TAX/SAVER II™ has full disk storage of data files (with optional password protection).

The manual includes information on special tax areas, lists of possible deductions and a tax glossary.

TAX/SAVER II™ compares itemized deductions to national averages; automatically computes certain limitations - for example, on medical deductions and contributions; checks for excess FICA; helps determine dependents. Yet, TAX/SAVER II™ offers the privacy and convenience of home use.

The user-oriented design with special screen formatting makes data entry, verification and correction easy. Yet you are always in control. You can skip any help features or parts of the program that you don't need.

TAX/SAVER II™

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- Interest & Dividends - Schedule B
- Tax Calculation - Tables, Rates
- Tax Savings Methods - Income Averaging, Maximum Tax, Alternative Tax
- Business Income - Schedules C & SE
- Capital Gains - Schedule D
- Allows you the privacy of your own home
- Lets you help friends and relatives with their taxes
- Has built-in aids. Answers specific questions like "Is my father my dependent?" and "Are my deductions reasonable?"
- Manual includes 1982 tax forms, information on special tax areas, lists of possible deductions, and glossary of tax terms
- Completes long and short forms including itemized deductions, excess FICA, earned income credit, community property, tax calculation (comparing all possible filing statuses in one run)
- Tax regulations are programmed in by our team of accountants. Just type in your figures & you've done your own tax return
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- Prints out on standard IRS forms overlays or plain tractor feed paper
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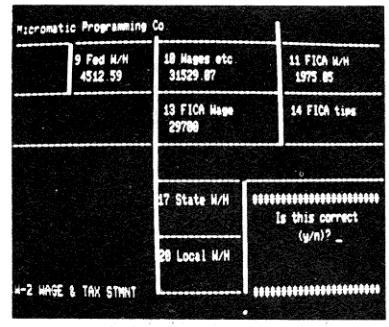

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** Availability of Model II programs uncertain at press time.

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*** ALL PROGRAMS ARE WRITTEN IN MACHINE LANGUAGE
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*** EACH UTILITY PROGRAM IS CALLED UP FROM **BASIC** USING THE SIMPLE BASIC COMMANDS PROVIDED
*** EACH UTILITY PROGRAM COMES WITH A **RACET COMPUTES** INSTRUCTION MANUAL
*** EACH INSTRUCTION MANUAL INCLUDES SEVERAL EXAMPLES OF UTILITY USAGE
*** EACH UTILITY ALLOWS THE USER TO PERFORM CERTAIN BASIC OPERATIONS TEN, TWENTY OR MORE TIMES FASTER THAN THE EQUIVALENT BASIC ROUTINE (FOR EXAMPLE, **GSF** CAN SORT AN ARRAY OF 1000 RANDOM NAMES INTO ALPHABETICAL ORDER IN UNDER 9 SECONDS!!)

GSF (GENERALIZED SUBROUTINE FACILITY)

- SORTS 1000-ELEMENT ARRAYS IN 9 SECONDS
- SORTS UP TO 15 ARRAYS SIMULTANEOUSLY (MIXED STRING, FLOATING POINT AND INTEGER)
- SORTS SINGLE OR MULTIPLE SUBSTRINGS AS ASCENDING OR DESCENDING SORT KEYS
- READ AND WRITE ARRAYS TO CASSETTE
- COMPRESS AND UNCOMPRESS DATA IN MEMORY
- MOVE ARRAYS IN MEMORY
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- ADDS PEEKS AND POKES (MOD-II VERSION ONLY)

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MODEL-II VERSION $50.00
MODEL-III VERSION $30.00

KFS-80 (KEYED FILE SYSTEM)

- CREATE ISAM FILES (INDEX SEQUENTIAL ACCESS METHOD)
- ALLOWS INSTANT ACCESS TO ANY RECORD ON YOUR DISKETTE
- INSTANTLY RETRIEVE RECORDS FROM MAILING LISTS, INVENTORY, ACCOUNTS RECEIVABLE OR VIRTUALLY ANY APPLICATION WHERE RAPID ACCESS IS REQUIRED TO NAMED RECORDS
- PROVIDES THE BASIC PROGRAMMER THE ABILITY TO RAPIDLY INSERT OR ACCESS KEYED RECORDS IN ONE OR MORE DATA FILES
- RECORDS ARE MAINTAINED IN SORTED ORDER BY A SPECIFIED KEY
- RECORDS MAY BE INSERTED OR RETRIEVED BY SUPPLYING THE KEY
- RECORDS MAY BE RETRIEVED SEQUENTIALLY IN SORTED ORDER
- RAPID ACCESS TO ANY FILE REGARDLESS OF THE NUMBER OF RECORDS
- MULTIPLE INDEX FILES CAN BE EASILY CREATED WHICH ALLOWS ACCESS OF A SINGLE DATABASE BY MULTIPLE KEYS (FOR EXAMPLE, BY BOTH NAME AND ZIP-CODE)

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MODEL-II VERSION $175.00
MODEL-III VERSION $100.00

DSM (DISK SORT MERGE)

- SORT AN 85K DISKETTE IN LESS THAN THREE MINUTES!
- SORTS LARGE MULTIPLE DISKETTE FILES ON A MINIMUM ONE DRIVE SYSTEM
- ALL RECORDS ARE PHYSICALLY REARRANGED-NO KEY FILES ARE REQUIRED
- SORTS RANDOM FILES CREATED BY **BASIC**, INCLUDING FILES CONTAINING SUB-RECORDS SPANNING SECTORS
- SORTS ON ONE OR MORE FIELDS IN ASCENDING OR DESCENDING ORDER
- FIELDS MAY BE STIRNGS, INTEGER, BINARY INTEGER OR FLOATING POINT
- THE SORTED OUTPUT FILE MAY OPTIONALLY HAVE FIELDS DELETED, REARRANGED OR PADDED
- SORT COMMANDS CAN BE SAVED FOR REUSE
- SINGLE SORT. MERGE. OR MIXED SORT/MERGE OPERATIONS MAY BE PERFORMED
- SORTED OUTPUT MAY BE WRITTEN TO A NEW FILE, OR REPLACE THE ORIGINAL INPUT FILE.

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MAILLIST (A MAILING LIST DATABASE SYSTEM)

- IDEALLY SUITED FOR ORGANIZATION MAILING LISTS, PERSONAL ADDRESSBOOK, OR MAILING LISTS BASED ON DATES SUCH AS REMINDERS FOR BIRTHDATES OR DUES PAYABLE
- USED ISAM (INDEX SEQUENTIAL ACCESS METHOD) FOR RAPID ACCESS TIMES
- YOUR **MAILLIST** CAN ALWAYS BE SORTED AND MAINTAINED BY UP TO FOUR INDEX FILES (FOR EXAMPLE, NAME, ZIPCODE, DATE AND NUMBER)
- **MAILLIST** ALLOWS UP TO 30 ATTRIBUTES TO BE SPECIFIED (TO BE USED IN SELECTION OF SPECIFIED RECORDS WHEN GENERATING REPORTS OR MAILING LABELS
- **MAILLIST** SUPPORTS BOTH 5 OR 9-DIGIT ZIPCODES
- PRINTING MAY BE STARTED OR ENDED AT ANY POINT IN THE LIST...THE USER CAN SPECIFY FIELDS OR CODES TO BE PRINTED
- CAPACITY IS 600 NAMES FOR MODEL-I, 3500 NAMES FOR MODEL II, 38,000 NAMES FOR MODEL II WITH HARD DISK DRIVE. 1200 NAMES FOR MODEL III

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MODEL-II VERSION $150.00
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HSDS HARD DISK DRIVE SOFTWARE

- MAKES TRSDOS COMPATIBLE WITH MOST HARD DISK DRIVES.
- ADDS MANY EXTRA FEATURES TO TRSDOS $400.00

COMPROC (COMMAND PROCESSOR)

- AUTO YOUR DISK TO PERFORM ANY SEQUENCE OF INSTRUCTIONS THAT YOU NORMALLY GIVE FROM THE KEYBOARD (FOR EXAMPLE, INSERT THE DISKETTE, PRESS THE RESET BUTTON, YOUR COMMAND FILE COULD AUTOMATICALLY SHOW YOU THE DIRECTORY, SHOW THE FREE SPACE ON THE DIKSETTE, LOAD A MACHINE LANGUAGE SUBROUTINE, LOAD BASIC, LOAD AND RUN A BASIC PROGRAM, AND SELECT A GIVEN ITEM ON YOUR MENU...ALL WITHOUT TOUCHING THE KEYBOARD!)

MODEL-I VERSION $20.00
MODEL-III VERSION $30.00
NOT AVAILABLE FOR MODEL-II

DISCAT (DISKETTE CATALOG SYSTEM)

- THIS COMPREHENSIVE DISKETTE CATALOGUING/INDEXING UTILITY ALLOWS THE USER TO KEEP TRACK OF THOUSANDS OF PROGRAMS IN A CATEGORIZED LIBRARY...FILE INCLUDES PROGRAM NAMES AND EXTENSIONS, PROGRAM LENGTH, DISKETTE NUMBERS AND FREE SPACE ON EACH DISKETTE...KEEP A COMPLETE CATALOG OF THE DIRECTORIES ON ALL YOUR DISKETTES IN ALPHABETICAL ORDER (SORTED ON EACH DISKETTE...OR COMPLETE ALPHABETICAL LIST OF PROGRAMS ON ALL YOUR DISKETTES)

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MODEL-III VERSION $50.00
MODEL-II VERSION (SEE MODEL-II UTILITY PACKAGE)

BLINK (BASIC LINK FACILITY)

- LINK FROM **BASIC** PROGRAM TO ANOTHER SAVING ALL VARIABLES
- THE CHAINED PROGRAM MAY EITHER REPLACE THE ORIGINAL PROGRAM OR CAN BE MERGED BY STATEMENT NUMBER

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- ADDS OVER 80 COMMANDS TO BASIC
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- COPY AND VERIFY ALL MACHINE LANGUAGE (SYSTEM) TAPES WRITTEN IN STANDARD FORMAT...IF YOU BUY A MACHINE LANGUAGE PROGRAM, **COPSYS** ALLOWS YOU TO EASILY COPY THE PROGRAM ONTO ANOTHER CASSETTE AS A BACKUP

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- DISKS BOOT FASTER TO DOS
- IMPROVE DISK I/O UNDER BASIC

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MODEL II FASTBACK — FULL DISK BACKUP IN 55 SECONDS

IN BUSINESS TIME IS MONEY, AND ONE BACKUP IS WORTH A THOUSAND TEARS.

- WORKS ON SYSTEMS WITH 2 OR MORE DRIVES
- CAN REPLACE YOUR EXISTING TRSDOS 1.2 or 2.0 BACKUP UTILITY

MODEL II ONLY $75.00

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MODEL-II UTILITY PACKAGE

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- RECOVER AND REPAIR FILES AND DIRECTORIES (BY JUST ENTERING A SINGLE COMMAND)
- XCOPY...SIMILAR TO COPY BUT CAN COPY ANY NUMBER OF FILES AT ONE TIME FASTER AND MORE ACCURATE THAN COPY SINCE RECORDS ARE COPIED IN GROUPS RATHER THAN ONE RECORDS AT A TIME...USING XCOPY YOU CAN COPY FILES THAT CAN NOT BE COPIED USING THE COPY COMMAND
- SZAP...PROVIDES THE CAPABILITY TO READ AND MODIFY ANY SECTOR ON A DISKETTE
- XHIT...CAN BE USED TO REPAIR A DISKETTE DIRECTORY
- DCS...DIRECTOR CATALOG SYSTEM IS A UTILITY FOR THE MANAGEMENT OF USER DISKETTES...SETS OF A MULTIPLE DISKETTE DIRECTORY FILE (WITH UP TO 1200 INDIVIDUAL FILE NAMES)...ALLOWS SELECTIVELY LISTED OR PRINTED LISTS OF DIRECTORY FILES IN COMBINED SORTED ORDER (FOR EXAMPLE, LISTED ALPHABETICALLY BY DISKETTE...OR A COMPOSITE ALPHABETICAL LIST OF ALL YOUR DISKETTES!)
- DEBUG-II...ADDS SEVERAL FEATURES TO THE PRESENT TRSDOS DEBUG UTILITY INCLUDING SINGLE INSTRUCTION CYCLE, AUTO (LOOP) BREAKPOINTS, SUBROUTINE CALLING, BREAK-KEY DETECTION AND MANY OTHERS

MODEL-II ONLY $150.00

MODEL-II DEVELOPMENT SYSTEM

- THIS PACKAGE IS A MUST FOR ASSEMBLY LANGUAGE PROGRAMMERS
- INCLUDES THE **MICROSOFT EDITOR ASSEMBLER PLUS** WITH ENHANCEMENTS FOR THE MODEL-II
- A COMPLETE DISASSEMBLER
- SUPERZAP FOR READING AND MODIFY ANY SELECTOR ON A DISKETTE

MODEL-II ONLY $125.00

MOD-II BASIC CROSS REFERENCE UTILITY

- LIST OR PRINT A SORTED CROSS REFERENCE TO ALL NUMBERS OR VARIABLES WITHIN A PROGRAM
- LIST OF PRINT ALL LINE NUMBERS CONTAINING A SPECIFIED STRING OF CHARACTERS

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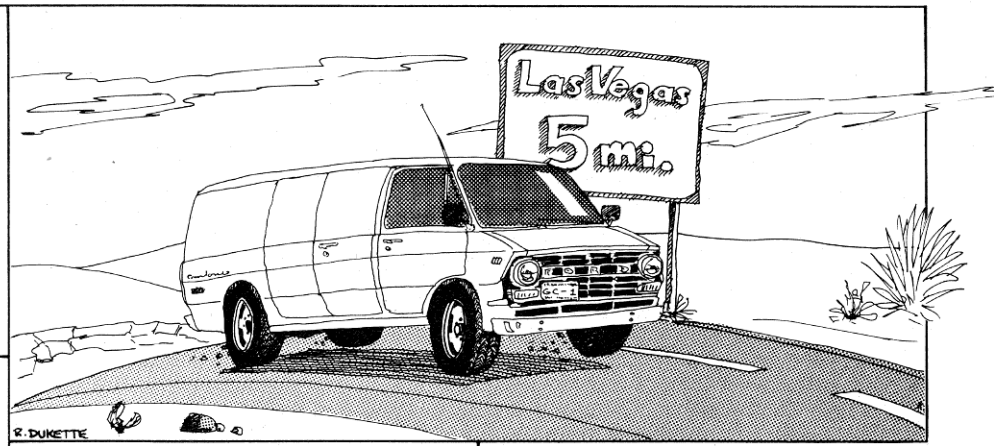
The GAMER'S CAFE

by Rodney Gambicus

Out of Vegas and into Asylum



Las Vegas doesn't like the unlucky. Mad Max and I had been walking the Strip for three days, trying to set up a mini-Cafe with a card table, the PMC, and Galaxy Invasion, and getting chased away from all the best places. Our hotel bill was overdue, and the van was lost at the Prairie Sunset Rest Home. We were about to gamble our last $3.70 at the MGM Grand when the bouncers threw the 10-year-old girl out in front of us.

"I was not card counting!" she yelled. "This is another system altogether! You take probability theory and—"

Max and I didn't listen to the rest, partly because she started shouting differential equations and partly because we'd never seen a child with battleship-gray hair. It wasn't battleship gray exactly, it was—

"Mercedes Silver," she introduced herself. "I dyed it when I was into punk, but I outgrew that now I'm in college." Max was gaping, but I managed to shake hands. "Did you see those guys at the casino? I was just trying a blackjack analysis I worked out on a TRS-80 at the Hop—"

At the words "TRS-80" we were all ears. "The Hop?"

"Johns Hopkins Center for Mathematically and Scientifically Precocious Youth," Mercedes said. "I've got a B.S. there; I'm supposed to go back for a master's this semester. My dad's a Radio Shack dealer in Baltimore. He sent me to Suzuki programming school when I was 3."

Max interrupted. "You say you have this gambling system—"

"Sequential forecasting. Probability analysis. Geez, don't you guys know from calculus or anything?"

"You can play cards," Max continued. "There's this nurse at a rest home outside of town who won this van full of TRS-80s that belongs to us, and if you could challenge her to a game..."

We climbed over the fence at Prairie Sunset and found the van in the staff parking lot. "Geez," Mercedes said again. "I was expecting something, you know, with bright colors and maybe a mural."

"There's some more mail here forwarded from Peterborough," Max said. Considering where we were, the letter was appropriate:

I need help getting past the guard at the beginning of Asylum. Are you supposed to trade with him? Or kill him? He keeps catching me and putting me in a straitjacket. And what do you do with the invisible inmate by the guard? What key do I need to open the doors where the inmates giggle or say "Let me out and I'll kill you"? What do I need to get into the officers' wing and stay there? And where do I get that?

Tom Abelson
6537 N. Keating
Lincolnwood, IL 60646

This letter started our usual argument. Max insisted we leave Tom to his fate—Max is an adventure Darwinist—and I wanted to help the readers and boost our image. A pay-phone call to William Denman, Med Systems president and cameo player in Asylum II, brought a compromise.

Fight, trade, or whatever, said Denman, you cannot get past the first guard; he'll always put you in the room with the burning straitjacket. Roll around if you find yourself on fire. If you slide a newspaper under the door and poke the keyhole to retrieve the key, you'll be able to tiptoe out and face a second guard; punch him and knock him out, and then frisk him to get enough keys and items to keep you going for a long time.

Past that, Med Systems sells hint sheets for $1. Remember Max's motto: "There are no invisible inmates, only inmates' voices coming from behind doors."

Speaking of Med Systems (or whatever they'll call themselves; there's talk of a merger and a name change), Denman revealed that Randall Don Masteller, author of the Warrior of Ras trilogy, has six more games due in early '83. A second, advanced trilogy will load characters from the first, which is recommended ("The odds are that, if you try any of these games as a Level I warrior, you will not come out alive"). A Wizard of Ras trilogy, while it won't load warrior characters, lets you do everything from throw stones to cast spells. Both feature better graphics than Dunzhin, Kaiv, and The Wylde; when you're attacked by monsters, the display zooms in on your immediate area, letting you see whom you're hacking and who's sneaking around for a flank attack.

* * * * *

"Mr. Max, is it?" came a voice from behind us. "Thinking of stealing back the truck?"

"Van," Max corrected, smiling back at the figure in white. "Actually, Nurse—"

"Lovelace. Ada Lovelace."

"—my friend here was hoping you'd agree to a rematch."

"Blackjack," Mercedes smiled by way of introduction. "You look like a woman who stands on 17."

* * * * *

It was no contest. On the first hand, Nurse Lovelace lost the Color Computer and Astro-Blast. Next, Mercedes claimed the Models Is and our adven-

ture collection; next, two IIIs and the Melbourne House library. The van and everything else took another half hour, during which I read some Gamer's Cafe feedback or input or whatever they call that section in the front of the magazine:

Michael Johnson (3138 Doggitt Drive, Spring Arbor, MI 49283) writes to say that Jim Daniel's patch in the November 1982 issue, adapting the Alpha Products joystick to Voyage of the Valkyrie, works on the Model I but leaves Mod III owners out in the cold. Jim wonders whether the two PEEK statements (16458 and 16459) in line 10000 would be hardware-specific. Any Model III Wagnerians out there with a patch for the patch?

* * * * *

"On the road again," bellowed Max—who usually prefers the Doors to Willie Nelson and who sings like the cassette port voice in Panik—as we headed out of town on Route 93. "Time to set up the awning and get computers on the sidewalk again, do the Johnny Appleseed of games bit. Anybody beat my score on Sea Dragon?" (No one has yet; send in those scores and screen photos, all games welcome.)

"I ought to trade in the Pocket Computers and get us a printer," Mercedes said, watching my monthly struggle with Scripsit. That "I" and "us" made Max and me turn around in the middle of driving and writing. "I own all this stuff now, you know. It's a kick."

Well, she's right. First my partner Winthrop goes Color Berserk and ends up in a rest home, and now we men are working for a 10-year-old. We're supposed to be taking her to Baltimore. Maybe her dad can get us a copy of Poltergeist. ■

Apple Panic	Mad Max	51,400
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Galaxy Invasion (Big 5)	Winthrop	1,000,000**
Sea Dragon	Mad Max	147,910+
Swamp Wars	Winthrop	39,200++

* Method I. Winthrop racked up 281,000 points using Method II.

** Winthrop still had six ships left, but he got bored.

+ Novice mode. Max got 69,480 in the expert mode.

+ + Winthrop got through all nine swamps, too.

Gamer's Cafe readers are invited to submit their high scores, for these and other TRS-80 games. We'll print unvalidated scores, but validated scores (a photo of the screen) will, of course, rank higher in prestige.

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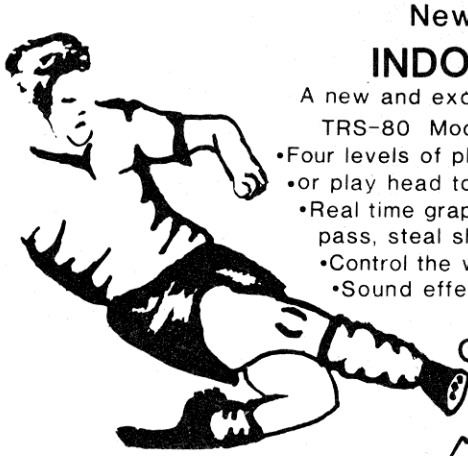

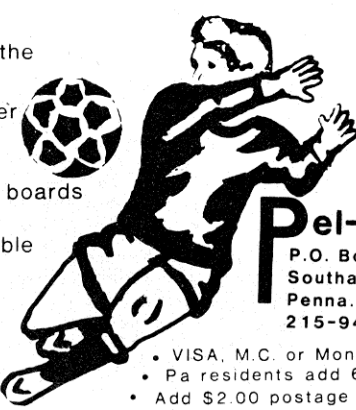

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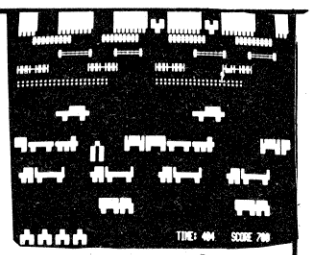

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If you just bought another computer, boy are you gonna be sorry.

Epson.

The new Epson QX-10 is unlike any personal computer you've ever seen. It's a computer for people who don't have the time to learn computers; a computer you can be using within minutes.

And fortunately, you don't have to take our word for it. Here's how *Byte*, one of the computer industry's most prestigious magazines, describes the QX-10.

The first anybody-can-use-it computer.
"The Epson QX-10 (is) a computer for less than $3000 that may well be the first of a new breed of anybody-can-use-it 'appliance' computers ... In addition to being a highly integrated word processing/computer system that offers as much usable processing power as almost any existing microcomputer, the QX-10 ... system is designed to be used by people with minimal technical knowledge. We've certainly heard that claim before, but Epson has delivered on this promise in a way and to an extent that *no* microcomputer manufacturer has done."

That's nice to hear from a magazine like *Byte*, of course, but it doesn't surprise us. It's just what we intended the QX-10 to be all along.

More computer. Less money.
But useability isn't the only thing the QX-10 has going for it. As *Byte* says, "the QX-10 gives you a great deal for your money.

"Help is available at any time through the HASCI (Human Application Standard Computer Interface) keyboard Help key ... Text can be entered at any time just as you would in a conventional word processor. The Calc key turns the system into a basic 4-function calculator. Graphics can be created via the Draw key. The Sched (schedule) key gives you access to a computer-kept appointment book, a built-in clock/timer/alarm, and an event scheduler."

Advanced hardware for advanced software.
As for hardware, *Popular Computing*, another industry leader, says: "The QX-10 includes ... a number of advanced hardware features ... The basic components of the system are a detachable keyboard, a high resolution monochrome display, and a system unit containing two 5¼ inch disk drives. The drives use double-sided, double-density disks (340K bytes per disk) and are amazingly compact ... The QX-10 uses an 8-bit Z80A microprocessor. The system contains 256 bytes of RAM. Some of the RAM is ... battery powered ... which lets the computer retain information when the power is off."

You won't have to wait much longer.
The new Epson QX-10 may very well be the computer you've been waiting for. And fortunately, you won't have to wait much longer — it will be appearing soon in computer stores all across the country. In the meantime, write Epson at 3415 Kashiwa Street, Torrance, CA 90505, or call (213) 539-9140. We'll be happy to send you copies of our reviews.

After all, as *Popular Computing* puts it, the QX-10 will "do for computing what the Model T did for transportation."

And we couldn't have said it better ourselves.

✓97

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YOUNG PROGRAMMER'S 80micro WINNERS CONTEST

1982-1983

We've known for some time that kids make up a significant portion of the TRS-80 population. Still, we weren't ready for the response we got to our first annual Young Programmer's Contest.

The number of entries—nearly 200—was, by itself, impressive. But what struck us was the ambition, skill, and creativity shown by the entrants. Even some of the programs that didn't win are good enough to be published, and will appear in future issues.

Our three-man panel of judges scored the entries in five categories:

Programming elegance. Here we looked at how well the program was written and performed its task, and how attractive the screen displays were. We also considered the ease with which the program could be used.

Documentation. First, we looked for descriptions of how to use the program and how it worked. We gave extra points for when flowcharts, variable lists, program listings, and tables were included.

Originality. This was a tough one to measure, since little software under the sun is entirely new. We finally decided to measure originality by how much creative thinking went into designing the program.

Error-trapping. How tough was it for us to crash the program?

Usefulness. In the case of a game, we measured usefulness by how entertaining it was.

The Grand Prize

The grand-prize winner turned out to be 16-year-old David Schmidt's Quest for the Key of Nightshade, an adventure game for the Model I. Quest is one of the better adventure games we've seen in a while, and it scored high in every category.

What impressed us the most about Quest was the fascinating and internally consistent world it paints. David gives the land of Nightshade so much detail that it seems almost three-dimensional. And what greater praise can be given to a fantasy than that it seems real?

Quest was one of four games that won prizes. But games aren't all you'll find in the next 78 pages. Here's a quick look at our other winning entries:

Project Deep Dive, by Michael John Lake, won first place in the 14–18 category. The game puts you in a submarine, which must fight its way through a tunnel to get to its base. First prize in the 11–13 category went to Carl Huben for his submission Music Composer, which tells you how to turn your computer into a piano keyboard. And topping the 10-and-under category was Terry Myerson's program Super-Draw, which lets you draw and save figures on your Model III.

Larry Brackney's TRS-Turtle took second prize in the 14–18 group. It lets you use your Model I to explore some of the features of Logo. In the 11–13 group, second place was won by Beth Norman for her adventure game Lair of Kraken. And Nathan Miller's joystick game Byte-Cycles was runner-up in the 10-and-under category.

Lloyd Kupchanko's Boxing Game, a machine-language arcade game for the Model I, finished third in the 14–18 group. We had a tie for third in the 11–13 category—Jennifer Neidenbach's Foreign Flag Quiz and Scott Steele's bulletin board program CASS-80. And third place in the 10-and-under group was won by Adam Wells for his submission countdown.

If you're interested in seeing what kids are doing with their computers these days, by all means check out the Young Programmer's Contest winners.

And if you're 18 or under, start working on your entry for our next competition. This year's contest set some pretty high standards to match. ■

Quest for the Key of Nightshade

by David Schmidt
Grand Prize

The objective of Quest for the Key of Nightshade is threefold. First, the adventurer must attempt to increase the size and strength of his army. Next, the adventurer must try to collect five pieces of a key that lay scattered throughout the Land of Nightshade. Once all pieces have been collected and the adventurer has a large and powerful army, he can attempt to capture Castle Nightshade. The purpose of this is to rescue the good king who is held prisoner by the evil emperor currently ruling the land.

The Key Box
Model I or III
16K, 32K RAM
Cassette or Disk Basic
Assembly Language
Editor/Assembler Opt.

The Display

The screen display is divided into five sections. The uppermost section merely displays the game's name. The section furthest to the left displays the status of the entire army. In the middle of the screen is a graphic map depicting the terrain around the player. The lowermost section is used as a communications box. Its purpose is to display warnings and other necessary messages. The section furthest to the right displays the current options available to the player and requests a command. The display always depicts the status and options pertaining you, the player, *and* your army.

The Map

The land of the nightshade is 30 by 30

Living Beings

Crimson Reaper

Domain: Castle
Fighting Ability: 15
Special Attributes: None

The Crimson Reaper is a highly trained warrrior. He wears partial plate armor and a helm. The Reaper is armed with a bastard sword and a spiked shield.

The Crimson Reaper has awesome strength and speed. Pain has no effect on him. So, to remove him from battle, he must be killed.

These warriors guard the treasures of Castles Death Shadow and Gray Stone. The Reapers never talk and are rarely seen outside of a castle. Because of their great fighting power, they are feared by all. In fact, many people believe the Reaper is not a human at all, but a disciple of the beast.

Firedrake

Domain: Castle
Fighting Ability: Variable
Special Attributes: None

The firedrake is the true dragon. It stands about 10 meters tall and has a wingspread of over 20 meters. This beast has immense claws and fangs, and it breathes fire.

The dragon is located in Castle Nightshade. Its purpose is to protect the imprisoned king. The fighting ability of the dragon is determined by the skill level you choose.

Jo-Toe

Domain: Water areas
Fighting Ability: 4
Special Attributes: None

The jo-toe is 2 meters tall and looks like a cross between a wingless bird and a reptile. It has very large webbed feet. The powerful tail is used for balance and propulsion in the water. The jo-toe has a long neck and a small head which is mostly beak.

The creature can run at speeds of over 60 kilometers per hour. This is its main defense, because it is a terrible coward. When cornered, it will fight by kicking with its large clawed feet and by jabbing with its beak.

The jo-toe is a herbivore and scavenger. It spends most of the day wading through the swamps looking for tender shoots of grass. It does enjoy a dead carcass when available.

The creature is basically timid and need not be feared if you are careful.

Kathake

Domain: Desert
Fighting Ability: 5
Special Attributes: Treasure carrying

The kathake is a female warrior from the desert tribe of the Thake. This human is armed with a large curved sword called a kantana. She wears a cloak and has little or no armor.

The kathake, though not a good sword fighter, is very quick and

continues on page 86

units. Each unit is one possible location you can occupy. The display shows a small portion of the map with your party in the center. The map depicts the terrain for four units in each direction. As you move you stay stationary relative to the display while the map moves under you. Small graphic characters on the map symbolize conditions present at that location. The meanings of the symbols are in Table 1.

Landmarks such as rivers, lakes, mountains, and deserts are in the same positions during each game. The locations of man-made objects like bridges, towns, cities, castles, and tombs, vary however, from game to game.

Marketplace

In the marketplace you can buy all items for yourself and your army. Marketplaces can be found in any human settlement. Items will cost more in a smaller settlement than in larger cities. When you buy an item, you buy it for the entire army. Certain items such as weapons, armor, and men always require you trade in present equipment. The medium for trade in the marketplace is gold fashioned into small pieces.

Weapons and Armor

Weapons and armor make an army more powerful. The greater the number of weapons, the greater the fighting strength. The fighting ability is a number representing fighting strength. You can find this number by adding the armor class and sword class, plus one. The higher the number, the greater you are in battle. Fighting ability is subject

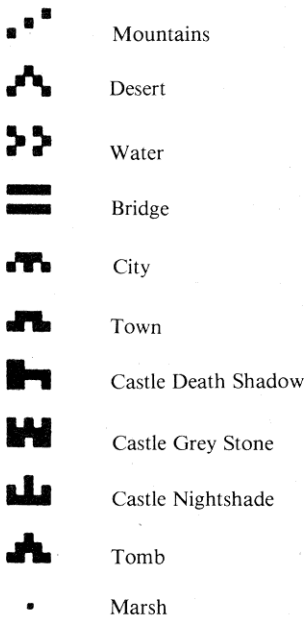

Table 1. Symbols

continued from page 85

therefore she is not to be taken lightly. The greatest danger is that they will use any means to win at battle. For example, females will approach a male seductively, only to kill him once close enough.

The kathake's primary form of livelihood is piracy. The women travel in nomadic bands across the desert in search of a prize. The males of the tribe stay near the camp, while the females become the warriors.

Kathakes always carry the treasures of their victims with them.

Kilgard

Domain: Open
Fighting Ability: 7
Special Attributes: Edible

The kilgard is a 6-meter long, fur-covered serpent. The fur of the beast is a greenish-brown, which helps it to hide well in long grass and trees. The snake has very large venemous fangs that can pierce most types of armor. Large folds of pointed skin protrude from the head, helping directional hearing.

The kilgard is a quick and agile fighter for its size. The snake will lunge at an enemy with its immense fangs while its tail whips around, striking a blow on the opponent. This beast will attempt to smother the life out of an enemy by coiling around him and then constricting.

The kilgard is a nocturnal creature. It can be found in shady knolls during the day. The kilgard's favorite place is a large tree limb.

The flesh of the kilgard has an enjoyable taste; if fact, many humans consider it a delicacy.

Merlad

Domain: Water areas
Fighting Ability: 11
Special Attributes: Treasure carrying

The merlad is an amphibious humanoid. The creature is covered with scales and has a membrane protruding from the rear parts of its body. The merlad has gills and can also breath air directly. It has large fangs and claws.

The primary weapon of the amphibian is a trident. The beast can throw the weapon as far as 40 yards with great accuracy. The trident is also used like a lance at close hand-to-hand combat. When not armed with a trident, the merlad is still very dangerous, using its fangs and claws to fight.

Merlads live in small, partially submerged cities. A merlad's primary food source is fresh water clams, crawfish, and fish. The creatures will kill humans who get too close to their cities, and reap the benefits from their purses.

Metore

Domain: Water areas
Fighting Ability: 8
Special Attributes: Edible

The metore is a cross between a shark and an alligator. The fish is about 3 meters long and looks very much like a shark. The skin of the fish is very rough and thick. It has massive saw-edged teeth and an extremely powerful jaw. Its fins have bones in them and can be used like feet.

The fish fights like a shark in the water and like an alligator on land. The fish will attempt to rub its skin against its prey because its skin is like coarse sandpaper. The fish also thrash with its tail. The metore is driven into a frenzy by the presence of salt in the water.

The fish hunts for food—it is a total carnivore. With the boned fins, the metore can make excursions onto land to hunt or to sun itself. The fish live in deep underwater caves. Their flesh is edible and tastes much like pork.

When entering the water, you'd better hope a metore isn't swimming silently under you.

Quandar

Domain: Mountains
Fighting Ability: 5
Special Attributes: Treasure carrying

The quandar is a 1½-meter tall feline humanoid. It is an intelligent social animal armed with a small sword. Although it is the same size as a human, it possesses far greater

continues on page 88

Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
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- **Right justification**
- **Easy hyphenation**
- **Drives any printer**
- **Embedded format and control codes**
- **Runs in 16K, 32K, or 64K**
- **Menu-driven disk and cassette I/O**
- **No hardware modifications required**

THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...
— Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

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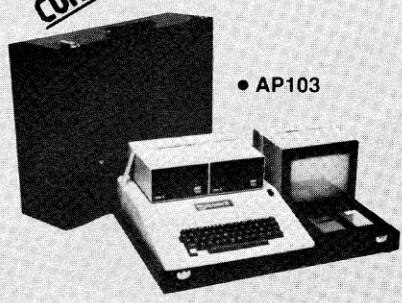

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to change by fatigue and randomness. A list of sword classes and armor classes is in Table 2.

Food, Water, and Potions

Food, water, and potions are required to play the game. You use food and water to feed your army, and can only carry 25 units of each. One unit is consumed during each turn. The supplies can be bought in the marketplace or they can be acquired in the wilderness. Food supplies are replenished each time you kill an edible beast. Water stores can be refilled by entering any body of water (either a lake or a river).

You can carry only 10 potions at any time. When consumed, they refresh you and return the fatigue number to 0 percent. Potions cannot be found in the open—they must be bought in the marketplace. If an army is out of food and water (represented by a negative number on the status display) for several days, all members will die from starvation or dehydration.

Armor	
Leather	1
Chain	3
Plate	5
Swords	
Short	2
Long	3
Broad	5
Two-Handed	7

Table 2. Armor and Weapon Classes

Fatigue

As you move and fight across the land, you are bound to become tired. This factor is displayed in the status list

continued from page 86

strength. The coat of the animal is so fine that it is often illegally hunted just for this purpose.

Quandars are not very good fighters. Their tactics consist of running whenever possible. If this is not plausible, they will attempt to disarm their opponent so that they can use their strength advantage in hand-to-hand combat.

Quandars are generally a thieving race. Because their ancestory is feline, they are very stealthy. For this reason they can enter a dwelling and burglarize it before the occupants even know of their existence. Most quandars become outlaws, but some live in harmonious coexistence with man. They carry the prizes from their crimes.

Sand Devil

Domain: Desert
Fighting Ability: 8
Special Attributes: None

The sand devil appears to be 2 meters tall and part man, part beast. Actually the beast is as far removed from a man as is a sneeth. It has no intelligence and acts purely on instinct. A horn protrudes from the top of its head, and long claws sit on the end of its fingers. The sand devil has awesome strength but is rather slow.

The sand devil will fight everything it encounters; this is simply its nature. The animal doesn't use its horn or its claws as weapons, but it attempts to crush its victim between its bare hands. Upon seeing an animal's movement, the beast will charge directly at it, not giving the enemy time to think. Once the animal has been killed, the sand devil will devour it, human or not.

The sand devil spends all its time wandering around the desert looking for food. It has a voracious appetite and will eat anything. The only thing the sand devil can offer the adventurer is danger.

Scorch

Domain: Desert
Fighting Ability: 6
Special Attributes: Edible

The scorch is a vicious, meter-long sand lizard. A long poisonous spike is connected to the end of the scorch's tail. Scorches also have small blunt teeth and long sharp claws. The scorch has thick scaly skin and a dorsal membrane.

Its teeth are ineffective as weapons, so the scorch uses its poisonous tail spike as its major defense. The potent poison on the tail will kill a man in about 5 minutes unless an antidote of jo-toe blood is consumed. The scorch's greatest asset is the advantage of surprise. The skin of the beast so closely matches its

as a percent. The lower the percent the less tired you are; the higher the percent the more tired you are. This factor can be affected by a number of things: terrain, equipment, army's state of health and the battles fought.

If the fatigue number reaches 100 percent, men may begin to die. The dead men's supplies will automatically be distributed evenly among the remaining crew. In these situations you will die last. Fatigue percentage is the average fatigue percent of the entire army.

Encounters

As you enter tombs or castles, or just wander across the land, you are bound to run into other living beings. When this happens, you may retreat. The fighting abilities of beings will vary as much as their domain. Killing these beings can be beneficial: survival, treasure, key piece, and entrance to a tomb or a castle. The outcome of a battle is determined by the relative fighting numbers of the beings and your army, and by the numbers of each. The only exception to this rule is when the army is in the water—then they can't defend themselves. A detailed list of the beings is in the sidebar.

Castles and Tombs

Castle Death Shadow, Castle Grey Stone, and tombs are the locations of treasures and possibly key pieces. You can attempt to conquer a castle or a tomb by killing the beings defending them. In this case you gain the entire treasure. You can also attempt to burglarize a castle, gaining only part of the treasure. To do this a thief must be present in the ranks of the army. After you and your party have left the structure, it will be reinhabited.

Castle Nightshade

Castle Nightshade is the final objective of the game. It is three large connected towers with no windows. The only entrance to the castle is through a locked door that can only be opened with a completed key. A den of firedrakes protect the castle and its contents. Only when the king is free is the game finished.

Skill Level

The skill level option is added to always make the game a challenge. The greater the number you enter, the tougher the resulting game will be. This number has an effect on randomness of encounters, number of beings per encounter, and the fighting ability of certain beings. ■

David Schmidt, age 16, can be reached at 6513 W. 32nd St., Loveland, CO 80537.

surroundings that an adventurer can step on it before he even perceives it.

The animal spends most of the day motionless to avoid exertion in the heat. At night the animal hunts small rodent-like creatures called podoms. Scorches are often domesticated and herded like cattle to be used as a meat source.

Shadow Beast

Domain: Tomb
Fighting Ability: 12
Special Attributes: None

The shadow beast is a large panther-like animal. The coat of the creature is a sleek black color. It has large white gleaming teeth. The eyes of the shadow beast glow red with an intensity that far surpasses the mere reflection of light.

Few people have ever seen how the beast fights and lived to tell about it. Legend claims that the beast only has to look at a person to kill him, but the shadow beasts actually fight like any other cat.

Because they live in tombs and because their eyes glow red, it is commonly believed the beasts are apparitions from hell. They are never seen outside of a tomb and no one knows what they eat. This legend of the shadow beast coming from hell seems to have a very solid factual basis.

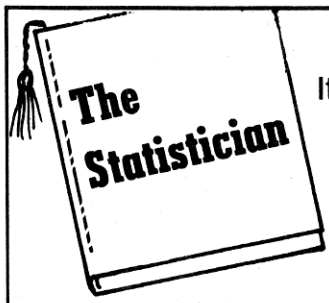
continues on p. 92

Program Listing

```
10 CLEAR100:RANDOM:DEFINTA-Z:DEFDBLP:DIMM(31,31),M$(11),T$(11),F
T%(11),WM%(11),MO$(11,3),MO%(11,3)
12 CLS:PRINT@464,"";:INPUT"ENTER DIFFICULTY FACTOR (1-20)";CT%:I
F(CT%<1ORCT%>20)THEN12ELSECLS:PRINT@460,CHR$(23);"** INITIALIZIN
G **":FORA=1TO3
17 RESTORE:B=RND(10):FORC=1TOB:READD,E:NEXT:IFM(D,E)=4THEN17ELSE
M(D,E)=4:NEXT:RESTORE:FORA=1TO20:READB:NEXT:FORA=1TO30:READB:FOR
C=1TOB:READD,E,F:IFF=3THENFORG=D-1TOE+1:FORH=A-1TOA+1:IFM(G,H)=0
THENM(G,H)=11:NEXT:NEXTELSENEXT:NEXT
30 FORG=DTOE:IFM(G,A)<>4THENM(G,A)=F:NEXT:NEXT:NEXTELSENEXT:NEXT
:NEXT
35 FORA=1TO4
50 B=RND(30):C=RND(30):IF(M(B,C)>2ANDM(B,C)<11)THEN50ELSEM(B,C)=
5:NEXT:FORA=1TO10
80 B=RND(30):C=RND(30):IF(M(B,C)>2ANDM(B,C)<11)THEN80ELSEM(B,C)=
6:NEXT:FORA=7TO9
110 B=RND(30):C=RND(30):IF(M(B,C)>2ANDM(B,C)<11)THEN110ELSEM(B,C
)=A:CX%(A-6)=B:CY%(A-6)=C:NEXT:FORA=1TO5
116 B=RND(30):C=RND(30):IF(M(B,C)>2ANDM(B,C)<11)THEN116ELSEM(B,C
)=10:TX%(A)=B:TY%(A)=C:NEXT:C=0:D=0:FORA=1TO5
118 B=RND(4):IF(B=CORB=D)THEN118ELSEIFB=1THENC=1ELSEIFB=2THEND=2
ELSEIFB=3THENLH%=LH%+1
119 L(A)=B:NEXT:FORA=0TO10:FORB=1TO3:READC:M$(A)=M$(A)+CHR$(C):N
EXT:NEXT:M$(11)=" . ":FORA=0TO3:FORB=1TO3:READA$,C:MO$(A,B)=A$:M
O%(A,B)=C:MO$(11,B)=A$:MO%(11,B)=C:NEXT:NEXT:FORA=0TO11:READA$:T
$(A)=A$:NEXT:FORA=1TO7:READAR$(A),FA%(A),FB%(A),P(A):NEXT:DEFDBL
G,JK
150 X=RND(30):Y=RND(30):IFM(X,Y)>0THEN150ELSEWR%=1:FO%=25:WA%=25
:SW$="SHORT  ":AR$="LEATHER ":G=10000:FT%=15:FT%(1)=10:FT%(2)=5:
FT%(11)=2:WM%(1)=1:FB%=4:PO%=10:TG%=1:TL%=1:CLS
160 PRINT@0,STRING$(63,131);:PRINT@128,STRING$(63,176);:PRINT@78
5,STRING$(46,131);:PRINT@960,STRING$(63,176);:FORA=0TO960STEP64:
PRINT@A,CHR$(191);:PRINT@A+62,CHR$(191);:IFA>128THENPRINT@A+17,C
HR$(191);:IFA<768THENPRINT@A+45,CHR$(191);
180 NEXT:PRINT@65,STRING$(14,"=");"QUEST FOR THE KEY OF NIGHT SH
ADE";STRING$(15,"=");:FORA=194TO898STEP64:READA$:PRINT@A,A$;:NEX
T
190 GOSUB200:GOTO210
200 PRINT@200,X;:PRINT@206,Y;:PRINT@209,CHR$(191);:PRINT@267,T$
(M(X,Y));:PRINT@333,K;:PRINT@391,"";:PRINTUSING"**#,######";G;:P
RINT@458,T;:PRINT@523,WR%;:PRINT@585,SW$;:PRINT@649,AR$;:PRINT@7
14,FA%;"% ";:PRINT@775,FO%;:PRINT@840,WA%;:PRINT@906,PO%;:RETURN

210 C=210:PRINT@210,"";:FORA=Y-4TOY+4:FORB=X-4TOX+4:IF(A<1ORA>30
ORB<1ORB>30)THENPRINT" + ";ELSEPRINTM$(M(B,A));
220 NEXT:C=C+64:PRINT@C,"";:NEXT
222 IF(M(X,Y)=5ORM(X,Y)=6)THEN800ELSEIFM(X,Y)=3THENWA%=25:FT%(3)
=2*FT%:PRINT@859,"* WATER SUPPLIES REFILLED *";:GOSUB8500:GOSUB2
00
225 IFM(X,Y)=7THENA$="CASTLE DEATH SHADOW":GOSUB2490ELSEIFM(X,Y)
=8THENA$="CASTLE GREY STONE":GOSUB2490ELSEIFM(X,Y)=9THENGOSUB290
```

Listing continues



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Listing continued

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0ELSEIFM(X,Y)=10THENGOSUB2600
226 IFRND(3+INT(CT%/5))=1THENGOSUB6005
227 FORA=16438TO16441:POKEA,0:NEXT
228 IFFA%>69THENPRINT@867,"** WARNING **";:PRINT@926,"- FATIGUE
LEVEL HIGH -";:GOSUB8500
230 GOSUB4000:PRINT@245,"N";:PRINT@309,"[";:PRINT@369,"W ";CHR$(
93);" + ";CHR$(94);" E";:PRINT@437,CHR$(92);:PRINT@501,"S";:IFM(
X,Y)=3THENI=627:GOSUB1750:GOTO250ELSEPRINT@562,"(R)EST";
235 IFPO%>0THENPRINT@623,"(T)AKE POTION";:I=756:GOSUB1750ELSEI=6
92:GOSUB1750
250 IFA$="N"THEN260ELSEIFA$="E"THEN270ELSEIFA$="S"THEN280ELSEIFA
$="W"THEN290ELSEIF(A$="R"ANDM(X,Y)<>3)THEN300ELSEIF(A$="T"ANDPO%
>0ANDM(X,Y)<>3)THEN340ELSEGOSUB500
252 GOSUB2000:GOTO250
260 IFY-1<1THEN310ELSED=0:E=-1:GOTO320
270 IFX+1>30THEN310ELSED=1:E=0:GOTO320
280 IFY+1>30THEN310ELSED=0:E=1:GOTO320
290 IFX-1<1THEN310ELSED=-1:E=0:GOTO320
300 PRINT@868,"<< REST >>";:GOSUB8500:D=0:E=0:FA%=FA%-30-FT%-FT%
(M(X,Y)):IFFA%+FT%+FT%(M(X,Y))<0THENFA%=0-FT%-FT%(M(X,Y)):GOTO32
0ELSE320
310 PRINT@850,"- EXPLORATION INTO AND BEYOND THE PERIMETER";:PRI
NT@922,"WILL AVAIL YOUR QUEST NOTHING.";:GOSUB8500:GOTO226
320 FA%=FA%+FT%+FT%(M(X,Y)):FO%=FO%-1:WA%=WA%-1-WM%(M(X,Y)):IF(F
O%<1ANDA$="R")THENFA%=FA%+3ELSEIFFO%<1THENFA%=FA%+6
325 IF(FO%<1ANDA$="R")THENFA%=FA%+2ELSEIFWA%<1THENFA%=FA%+5
326 IFWA%=0THENPRINT@863,"- WATER SUPPLY GONE -";:GOSUB8500
327 IFFO%=0THENPRINT@863,"- FOOD SUPPLIES OUT -";:GOSUB8500
330 X=X+D:Y=Y+E:IFWA%<-4THEN360ELSEIFFO%<-7THEN350
335 IFFA%>99THEN370
337 IFA$="R"THENGOSUB200:GOTO227ELSE190
340 PO%=PO%-1:FA%=0:PRINT@861,"+ ELIXIR POTION TAKEN +";:PRINT@9
17,"- YOU ARE NOW RESTORED TO 0 % FATIGUE.";:GOSUB8500:GOSUB200:
GOTO227
350 PRINT@865,"** STARVATION **";:PRINT@932,"- ALL DIE -";
355 GOTO8700
360 PRINT@865,"** DEHYDRATION **";:PRINT@932,"- ALL DIE -";
365 GOTO8700
370 FA%=95:PRINT@866,"** EXHAUSTION **";:IFM(X,Y)=3THEN700ELSEA=
RND(WR%+T+1):IFA=WR%+T+1THEN390ELSET=T-A:IFT<0THENWR%=WR%+T:T=0
375 IFWR%=0THEN400
380 FO%=FO%+FO%*A/(WR%+T):WA%=WA%+WA%*A/(WR%+T):PO%=PO%+PO%*A/(W
R%+T)
381 IFFO%>25THENFO%=25
382 IFWA%>25THENWA%=25
383 IFPO%>10THENPO%=10
385 IFA=1THENPRINT@930,"- 1 MAN DIES -";:GOTO387
386 PRINT@930,"-";A;"MEN DIE -";
387 GOSUB8500:GOTO190
390 PRINT@931,"- NONE DIE -";:GOSUB8500:GOTO190
400 PRINT@932,"- ALL DIE -";
410 GOSUB8700
500 PRINT@864,"-= INPUT ERROR =-";:GOSUB8500:RETURN
700 PRINT@931,"- ALL DROWN -";
710 GOSUB8700
800 PRINT@857,"- YOU HAVE JUST ENTERED A ";:IFM(X,Y)=5THENPRINT"
CITY -";ELSEPRINT"TOWN -";
810 GOSUB8500:GOSUB4000:PRINT@239,"- DO YOU WISH";:PRINT@303,"TO
 GO TO THE";:PRINT@367,"MARKET PLACE?";:I=499:GOSUB1740
820 GOSUB1610:IFA$="Y"THEN830ELSE230
830 PRINT@856,"- WHAT DO YOU WISH TO PURCHASE?";:GOSUB8500:GOSUB
4000::PRINT@240,"(A)RMOR";:PRINT@304,"(F)OOD UNITS";:PRINT@368,"
(I)NFO";:PRINT@432,"(M)EN";:PRINT@496,"(S)WORDS";
835 PRINT@560,"(P)OTIONS";:PRINT@624,"(W)ATER UNITS";:I=756:GOSU
B1750:IFA$="A"THEN840ELSEIFA$="F"THEN880ELSEIFA$="I"THEN980ELSEI
FA$="M"THEN920ELSEIFA$="S"THEN900ELSEIFA$="P"THEN890ELSEIFA$="W"
THEN885ELSEGOSUB500:GOTO835
840 GOSUB6000:PRINT@367,"(L)EATHER";:PRINT@431,"(C)HAINMAIL";:PR
INT@495,"(F)ULLPLATE";:I=628:GOSUB1750:IFA$="L"THENTG%=1ELSEIFA$
="C"THENTG%=2ELSEIFA$="F"THENTG%=3ELSEGOSUB500:GOTO840
850 P=P(TG%):P=P*(WR%+T):GOSUB1100:H#=P:GOSUB2300:IFP=H#THENGOSU
B1400ELSEGOSUB1200
860 GOSUB1600:IFA$="N"THEN1700ELSEIFP<=GTHENG=G-P:AR$=AR$(TG%):G
OTO1700ELSE1800
870 GOSUB3000:IFN+E>DTHEN3050ELSEIFN=0THEN1700ELSEP=F*N*(WR%+T):
GOSUB1100:GOSUB1400:GOSUB1600:IFA$="N"THEN1700ELSEIFP>GTHEN1800E
LSEG=G-P:IFE<0THENE=N:RETURNELSEE=E+N:RETURN
880 D=25:E=FO%:F=3:GOSUB870:FO%=E:GOTO1700
885 D=25:E=WA%:F=1:GOSUB870:WA%=E:GOTO1700
890 D=10:E=PO%:F=20:GOSUB870:PO%=E:GOTO1700
900 GOSUB6000:PRINT@367,"(S)HORTSWORD";:PRINT@431,"(L)ONGSWORD";
:PRINT@495,"(B)ROADSWORD";:PRINT@559,"(T)WO-HANDED";:I=692:GOSUB
1750:IFA$="S"THENTL%=4ELSEIFA$="L"THENTL%=5ELSEIFA$="B"THENTL%=6
ELSEIFA$="T"THENTL%=7ELSEGOSUB500:GOTO900
905 P=P(TL%):P=P*(WR%+T):GOSUB1100:H#=P:GOSUB2400:IFP=H#THENGOSU
B1400ELSEGOSUB1200
910 GOSUB1600:IFA$="N"THEN1700ELSEIFP<=GTHENG=G-P:SW$=AR$(TL%):G
```

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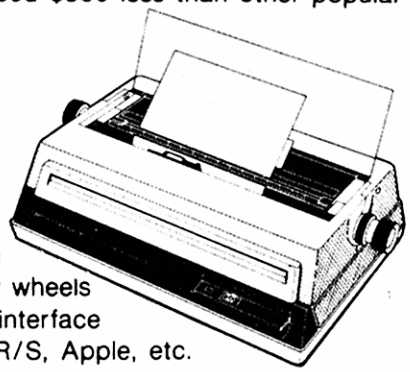

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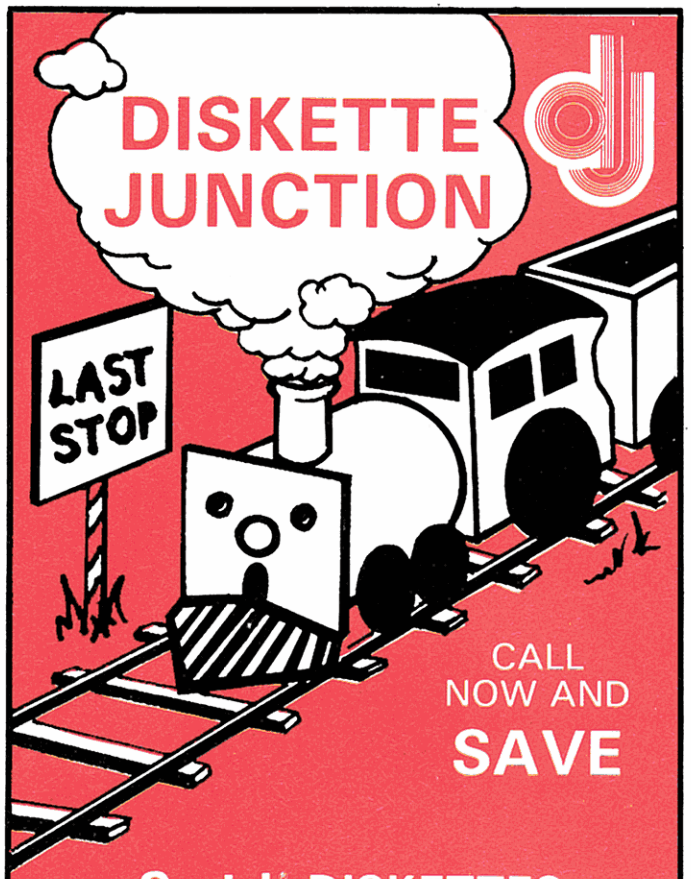

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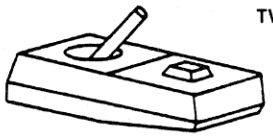

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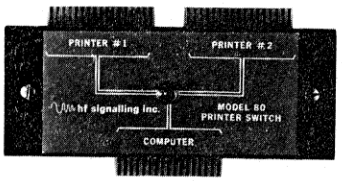

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continued from p. 89

Sneeth

Domain: Open
Fighting Ability: 10
Special Attributes: None

The sneeth is 2 meters long and closely resembles a terrestrial badger. The creature's torso is covered with a 5-centimeter thick calcium carapace. Two large tusks protrude from the lower jaw. The animal has a long powerful tail that resembles the tail of a rat.

The sneeth's main attack strength lies in its ability to teleport from location to location. The creature will use its tusks to thrust up and gore the opponent in battle. The sneeth will also use its tail as a weapon, flailing it about like a mace.

The sneeth is primarily a subterranean creature with poor eyesight and superb hearing. Ground hogs and other small rodents are the sneeth's primary sustenance. The animal is attracted to shiny or curious objects and will fight if necessary to obtain them.

Terolt

Domain: Open
Fighting Ability: 6
Special Attributes: Treasure carrying

The terolt is a meter-tall humanoid. Its body is covered with black hair, while the head of the beast is covered with long white hair. A vicious-looking pug face frames two rows of small razor-sharp teeth. The beast has long arms and fingers tipped with large claws. The terolt is armed with nothing but a celebus, a small sharp knife. Although small and squat in stature, the terolt is still very strong.

The greatest fighting strength of the creature is its ability to move with silent speed. It can remain motionless, hiding in bushes or trees, for up to three hours. Once the victim has almost stepped on it, the terolt will launch itself towards the prey. Landing on the prey, the terolt will plunge its celebus into the victim's body many times. Although experts at ambush, the beasts can't fight well when confronted in the open.

The terolt is nocturnal, sleeping during the day in caves and hunting at night. It hunts for three reasons: treasure, food, and sport. The heads of its kills adorn the walls of its cave.

Wolfaut

Domain: Mountains
Fighting Ability: 7
Special Attributes: None

The wolfaut looks like a 2-meter tall horse, although it is actually more like a wolf. The beast is black in color and is very heavyset. Being a carnivore, it has numerous sharp teeth. The wolfaut also has a horn in the middle of its forehead.

The wolfaut fights using its horn and its teeth. Given the chance, the beast will also attempt to trample its prey. The creature is powerful in battle and eats everything that it kills.

The wolfaut usually hunts in packs. Humans and humanoids are natural prey, as are other creatures. Although resembling a horse, wolfauts are far too dangerous to be used as a mount.

Xantau

Domain: Mountains
Fighting Ability: 14
Special Attributes: Edible

The xantau is a 5-meter long carnivore that resembles a terrestrial tiger. This beast has large front teeth and an extremely powerful set of jaws. When standing on its hind legs, the xantau can attain a height of over 8 meters, allowing it to see over the tops of most smaller trees.

The xantau is one the most dangerous beasts in the Land of Nightshade. Even though the creature is of tremendous size, it still possesses great speed and agility. The coat of the xantau is so thick that most swords can't even penetrate it. In battle the creature fights with his teeth and claws.

Xantaus live in caves far removed from settlements of human beings. They are extremely protective of their families and will fight to all ends to protect them. They primarily eat wolfauts and other large forest-dwelling beasts.

The flesh of the xantau produces no ill effects when eaten by man; in fact, it is often used for medicinal purposes. ■

Listing continued

```
OTO1700ELSE1800
920 GOSUB6000:PRINT@368,"(T)HIEVES";:PRINT@432,"(W)ARRIORS";:I=5
64:GOSUB1750:IFA$="T"THENP=675:E=1ELSEIFA$="W"THENP=550:E=2ELSEG
OSUB500:GOTO920
930 GOSUB3000:IFN=0THEN1700ELSEP=P*N:H#=P:GOSUB2300:GOSUB2400:IF
P=H#THENGOSUB1400ELSEGOSUB1200
940 GOSUB1600:IFA$="N"THEN1700ELSEIFP<=GTHENG=G-P:SW$="NONE    "
:AR$="NONE    ":TG%=0:TL%=0:FO%=(FO%*(WR%+T))/(WR%+T+N):WA%=(WA%*
(WR%+T))/(WR%+T+N):PO%=(PO%*(WR%+T))/(WR%+T+N):FA%=(FA%*(WR%+T))
/(WR%+T+N)ELSE1800
945 IFE=1THENT=T+N:GOTO1700ELSEWR%=WR%+N:GOTO1700
980 P=100:GOSUB1100:GOSUB1400:GOSUB1600:IFA$="N"THEN1700ELSEIFP>
GTHEN1800ELSEG=G-P:PRINT@851,"- ONE MOMENT PLEASE.  I WILL ASK A
ROUND TO";:PRINT@915,"SEE IF ANYONE KNOWS WHERE A PIECE IS.";:FO
RA=1TO3000:NEXT:GOSUB8500
982 P=2000:GOSUB1100:IFRND(5)>1THEN990ELSEB=RND(5):IFL(B)=4THEN9
90ELSEIFL(B)=3THENC=RND(LH%):E=TX%(C):F=TY%(C):P=P+500
984 PRINT@851,"- I HAVE FOUND THE LOCATION OF A KEY PIECE.";:GOS
UB1400:GOSUB1600:IFA$="N"THEN1700ELSEIFP>GTHEN1800ELSEG=G-P:IFL(
B)=3THENPRINT@851,"- A PIECE LAYS IN A TOMB LOCATED";:GOSUB5050:
FORA=1TO1500:NEXT:GOSUB8500:GOTO1700
986 IFL(B)=1THENA$="DEATH SHADOW"ELSEA$="GREY STONE"
988 PRINT@851,"- A PIECE OF THE KEY LAYS IN THE TREASURES";:PRIN
T@915,"OF THE CASTLE ";A$;".";:FORA=1TO1500:NEXT:GOSUB8500:GOTO1
700
990 PRINT@851,"- I AM SORRY, I CAN NOT FIND THE LOCATION";:PRINT
@915,"OF A KEY PIECE.";:FORA=1TO1500:NEXT:GOSUB8500:GOTO1700
1100 IFM(X,Y)=5THENRETURNELSEP=INT(P+(P/3)):RETURN
1200 PRINT@862,"-= WITH TRADE IN =-";:IFP<1THENP=0:GOSUB1500:RET
URNELSEGOSUB1400:RETURN
1400 PRINT@922,"* COST =";P;"GOLD PIECES *";:GOSUB8500:RETURN
1500 PRINT@923,"* THERE WILL BE NO COST *";:GOSUB8500:RETURN
1600 GOSUB4000:PRINT@238,"- DO YOU ACCEPT";:PRINT@304,"THE OFFER
?";:I=435:GOSUB1740
1610 IF(A$="Y"ORA$="N")THENRETURNELSEGOSUB500:GOSUB2000:GOTO1610

1700 FT%=FA%(TG%)+FA%(TL%)+15:FB%=FB%(TG%)+FB%(TL%)+1:GOSUB200:G
OSUB4000:PRINT@238,"- WILL THERE BE";:PRINT@303,"ANYTHING ELSE?"
;:I=435:GOSUB1740:GOSUB1610
1710 IFA$="N"THEN230ELSE830
1740 PRINT@I,"(Y)ES";:PRINT@I+64,"(N)O";:I=I+192
1750 PRINT@I,"COMMAND-";:I=I+8:GOSUB2000:RETURN
1800 PRINT@856,"-= YOU DON'T HAVE ENOUGH GOLD =-";:GOSUB8500:GOT
O1700
2000 A$="":PRINT@I,CHR$(32);:PRINT@478,STRING$(2,191);CHR$(149);
:FORA=1TO50:A$=INKEY$:IFA$<>""THENRETURNELSENEXT:PRINT@I,CHR$(14
3);:PRINT@478,M$(M(X,Y));:FORA=1TO50:A$=INKEY$:IFA$<>""THENRETUR
NELSENEXT:GOTO2000
2300 A$=LEFT$(AR$,1):IFA$="N"THENRETURNELSEIFA$="L"THENP=P-35*(W
R%+T):RETURNELSEIFA$="C"THENP=P-150*(WR%+T):RETURNELSEP=P-275*(W
R%+T):RETURN
2400 A$=LEFT$(SW$,1):IFA$="N"THENRETURNELSEIFA$="S"THENP=P-30*(W
R%+T):RETURNELSEIFA$="L"THENP=P-65*(WR%+T):RETURNELSEIFA$="B"THE
NP=P-180*(WR%+T):RETURNELSEP=P-200*(WR%+T):RETURN
2490 GOSUB2800
2500 GOSUB4000:GOSUB2700:PRINT@432,"(A)TTACK";:IFT>0THENPRINT@49
6,"(B)URGLARIZE";:PRINT@560,"(C)ONTINUE ON";:I=692ELSEPRINT@496,
"(C)ONTINUE ON";:I=628
2510 GOSUB1750:IFA$="A"THEN2520ELSEIF(A$="B"ANDT>0)THEN2530ELSEI
FA$="C"THENRETURNELSEGOSUB500:GOTO2500
2520 B$="SOLDIER":N=RND(CT%*5)+CT%*5:B=15:GOSUB7000:PRINT@866,"*
 BATTLE! *";:GOSUB8500:GOSUB7500:J=RND(N*3000)+N*1000:C=0:FORA=1
TO5:IFL(A)=M(X,Y)-6THENC=1:L(A)=0:GOSUB7600:GOTO6020ELSENEXT:GOS
UB7600:GOTO6020
2530 IFRND(3)=1THENPRINT@850,"** YOUR THIEF HAS BEEN CAUGHT AND
KILLED **";:GOSUB8500:T=T-1:GOSUB200:GOTO2500ELSEIFRND(5)>1THEN2
550ELSEPRINT@851,"- YOUR THEIF STOLE THE TREASURE AND RAN";:PRIN
T@915,"OFF WITH IT.";:GOSUB8500:T=T-1
2540 FORA=1TO5:IFL(A)=M(X,Y)-6THENL(A)=4:GOSUB200:GOTO2500ELSENE
XT:GOSUB200:GOTO2500
2550 PRINT@851,"- YOUR THIEF STOLE THE TREASURE AND";:PRINT@915,
"RETURNED IT TO YOU.";:GOSUB8500:J=RND(N*3000)+N*1000:C=0:FORA=1
TO5:IFL(A)=M(X,Y)-6THENC=1:L(A)=0:GOSUB7600:GOSUB200:RETURNELSEN
EXT:GOSUB7600:RETURN
2600 A$="AN ANCIENT TOMB":GOSUB2800:GOSUB4000:GOSUB2700:PRINT@43
2,"(C)ONTINUE ON";:PRINT@496,"(E)NTER TOMB";
2610 I=628:GOSUB1750:IFA$="C"THENRETURNELSEIFA$="E"THEN2620ELSEG
OSUB500:GOTO2610
2620 B$="SHADOW BEAST":N=RND(CT%*4)+CT%*4:B=12:GOSUB7000:PRINT@8
61,"* YOU ARE ATTACKED! *";:GOSUB8500:GOSUB7500:J=RND(N*2000)+N*
750:C=0
2630 FORA=1TO5:IFL(A)<>3THENNEXT:GOSUB7600:GOTO6020:RETURNELSEFO
RA=1TO5:IF(TX%(A)=XANDTY%(A)=YANDA<=LH%)THENFORB=ATO4:TX%(B)=TX%
(B+1):TY%(B)=TY%(B+1):NEXT:LH%=LH%-1:L(A)=0:C=1:GOSUB7600:GOTO60
20ELSENEXT:GOSUB7600:GOTO6020
2700 PRINT@239,"- WHAT DO YOU";:PRINT@303,"WISH TO DO?";:RETURN
2800 PRINT@851,"- YOU HAVE COME UPON ";A$;"!";:GOSUB8500:RETURN
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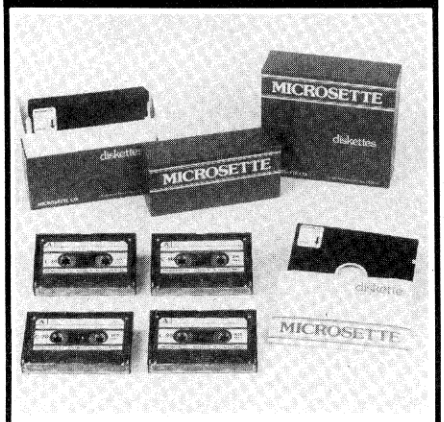

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```
2900 A$="CASTLE NIGHT SHADE":GOSUB2800:GOSUB4000:PRINT@239,"- DO
 YOU WISH";:PRINT@303,"TO ENTER THE";:PRINT@367,"CASTLE?";:I=499
:GOSUB1740:GOSUB1610:IFA$="N"THENRETURN
2910 IFK<5THENPRINT@851,"- YOU NEED A COMPLETED KEY TO GAIN ENTR
ANCE";:PRINT@915,"TO CASTLE NIGHT SHADE.";:FORA=1TO1500:NEXT:GOS
UB8500:RETURNELSEPRINT@851,"** YOU HAVE SUCCESSFULLY GAINED ENTR
ANCE **";:GOSUB8500:
2920 B$="FIREDRAKE":N=CT%*2:B=CT%*20+RND(20):GOSUB7000:PRINT@866
,"* BATTLE! *";:GOSUB8500:GOSUB7500:PRINT@855,"** YOU HAVE COMPL
ETED YOUR QUEST! **";:PRINT@915,"- THE KING IS SAVED AND THE LAN
D IS FREED!";
2930 GOTO8700
3000 K(1)=-1:K(2)=-1:GOSUB6000:PRINT@239,"- HOW MANY DO";:PRINT@
306,"YOU WISH?";:PRINT@431,"<ENTER> ENTERS";:PRINT@495,"<CLEAR>
ERASES";:PRINT@630,"   ";:I=630
3010 GOSUB2000:IF((ASC(A$)>47ANDASC(A$)<58)ORA$=CHR$(13)ORA$=CHR
$(31))THEN3020ELSEGOSUB500:GOTO3010
3020 IFI<632THEN3030ELSEIFA$=CHR$(31)THEN3000ELSEIFA$=CHR$(13)TH
EN3040ELSE3010
3030 IFA$=CHR$(31)THEN3000ELSEIFA$=CHR$(13)THEN3040ELSEPRINT@I,A
$;:I=I+1:K(I-630)=VAL(A$):GOTO3010
3040 IFK(2)=-1THENN=K(1):RETURNELSEN=K(1)*10+K(2):RETURN
3050 PRINT@854,"<< A MAN CAN'T CARRY MORE THAN";D;" >>";:GOSUB85
00:GOTO870
4000 FORA=238TO750STEP64:PRINT@A,CHR$(207);:NEXT:RETURN
5050 PRINT@915,"AT MAP X:";E;" Y:";F;:FORA=1TO3000:NEXT:GOSUB850
0:RETURN
6000 GOSUB4000:PRINT@239,"- WHICH TYPE?";:RETURN
6005 E=RND(3):B$=MO$(M(X,Y),E):IFB$=""THENRETURNELSEN=RND(CT%*5)
:B=MO(M(X,Y),E):GOSUB7000:IFM(X,Y)=3THENPRINT@861,"* YOU ARE ATT
ACKED! *";:GOSUB8500:GOSUB7500:GOSUB200:RETURN
6010 GOSUB4000::PRINT@239,"- DO YOU WISH";:PRINT@303,"TO ENGAGE?
";:I=435:GOSUB1740:GOSUB1610:IFA$="N"THENIFRND(7)>1THENRETURNELS
EPRINT@852,"* ATTEMPT TO DISENGAGE IS UNSUCCESSFUL *";:GOSUB8500

6015 PRINT@866,"* BATTLE! *";:GOSUB8500:GOSUB7500:C=0:IFE=2THENP
RINT@858,"* FOOD SUPPLY REPLENISHED *";:GOSUB8500:FO%=25ELSEIFE=
3THEN6020ELSEJ=N*D*(RND(300)+100):F=RND(5):IF(L(F)=4ANDRND(3)=1)
THENC=1:L(F)=0:GOSUB7600ELSEGOSUB7600
6020 FA%=FA%+30:IFFA%>99THENFA%=99:GOSUB200:RETURNELSEGOSUB200:R
ETURN
7000 PRINT@863,"-= ENCOUNTER =-";:GOSUB8500:PRINT@863,"* TYPE: "
;B$;:PRINT@927,"* NUMBER:";N;:FORA=1TO1500:NEXT:GOSUB8500:RETURN

7500 C=FB%+RND(3)-INT(FA%/45):D=B+(2-RND(3)):F=INT(N*D/C):H=INT(
(WR%+T)*C/D):IFM(X,Y)=3THENH=0ELSEIFF>(WR%+T)THENF=WR%+T
7510 IFH>NTHENH=N
7520 T=T-F:IFT<0THENWR%=WR%+T:T=0
7530 PRINT@863,"MEN KILLED:";F;:PRINT@927,B$;"S KILLED:";H;:FORA
=1TO1000:NEXT:GOSUB8500:IFWR%>0THENPRINT@860,"* YOU ARE VICTORIO
US! *";:GOSUB8500:RETURNELSEPRINT@861,"* YOU ARE DEFEATED *";
7540 GOTO8700
7600 G=G+J:PRINT@852,"* TREASURE COLLECTED:";J;"GOLD PIECES *";:
IFC=1THENPRINT@923,"* AND A PIECE OF THE KEY *";:K=K+1:GOSUB8500
:RETURNELSEGOSUB8500:RETURN
8500 FORA=1TO1200:NEXT:PRINT@850,CHR$(236);:PRINT@914,CHR$(236);
:RETURN
8700 GOSUB8500:GOSUB4000:PRINT@239,"- DO YOU WISH";:PRINT@303,"T
O PLAY AGAIN?";:I=435:GOSUB1740
8710 GOSUB1610:IFA$="Y"THENRUNELSENEW
9000 DATA21,1,22,5,24,9,22,12,22,16,26,20,20,23,16,24,18,28,27,2
8
10000 DATA3,8,10,2,15,18,1,21,21,3,3,10,11,2,14,19,1,21,21,3,3,9
,9,2,14,19,1,21,22,3,3,8,9,2,15,18,1,21,24,3,5,6,8,3,9,10,2,17,1
7,1,22,22,3,24,24,3,4,5,9,3,10,11,2,22,22,3,24,24,3,3,4,9,3,10,1
2,2,22,24,3,3,4,10,3,11,11,2,24,24,3,3,5,9,3,10,10,2,24,24
10010 DATA3,4,6,6,3,7,10,2,15,17,3,24,24,3,3,6,8,2,16,18,3,22,24
,3,3,6,6,2,16,16,3,22,22,3,2,7,8,2,21,22,3,2,8,9,2,21,23,3,2,8,1
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0,2,22,26,3,3,9,9,2,23,25,2,26,26,3,4,8,9,2,13,14,1,23
10020 DATA24,2,26,26,3,4,9,10,2,13,15,1,22,24,2,26,26,3,5,11,11,
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10030 DATA18,3,27,28,3,4,9,10,2,11,14,1,18,18,3,27,28,3,4,8,9,2,
10,14,1,18,18,3,27,27,3,4,10,11,2,13,15,1,18,18,3,26,27,3,4,8,10
,2,11,16,1,18,19,3,25,28,3,128,128,128,144,132,129,152,137,144,1
53,162,132,179,179,145,152,156,144,184,172,144
10040 DATA191,140,148,189,173,149,180,181,148,184,173,144,TEROLT
,6,KILGARD,7,SNEETH,10,KATHAKE,5,SAND DEVIL,8,SCORCH,6,QUANDAR,5
,XANTAU,14,WOLFAUT,7,MERLAD,11,METORE,8,JO-TOE,4
10050 DATA "OPEN  ",DESERT,"MTNS. ","WATER ",BRIDGE,"CITY  ","TO
WN  ",CASTLE,CASTLE,CASTLE,"TOMB  ","MARSH ","LEATHER ",2,1,80,"
CHAIN   ",5,3,350,"PLATE   ",10,5,600,"SHORT   ",1,2,75,"LONG
 ",2,3,150,"BROAD   ",3,5,250,2-HANDED,5,7,450
20000 DATA"MAP-X:    Y:","TERRAIN:","KEY PIECES:","GOLD:","THIEV
ES:","WARRIORS:","SWORD:","ARMOR:","FATIGUE:","FOOD:","WATER:","
POTIONS:"
```

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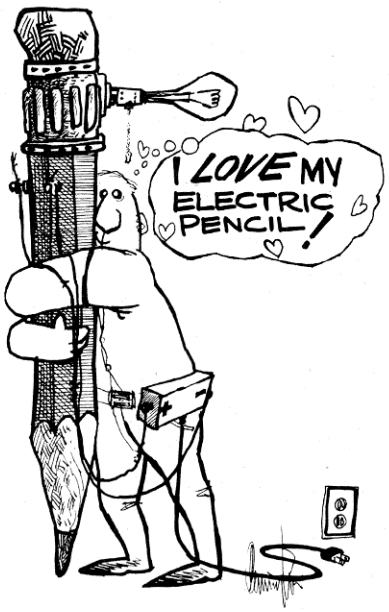

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Project Deep Dive

by Michael John Lake
First Place
14–18

Project Deep Dive is an arcade-style game with sound in which you command a submarine going down a long winding tunnel. You gain points for destroying other objects, and for docking at the end. After docking you start over again until you are destroyed.

Project Deep Dive will run on the Model I or III with 16K or Disk Basic with 32K.

About the Program

The original version of Deep Dive had only a slow speed, no sound, slower graphics, and less action. After realizing the potential of game programming, I quickly expanded the original game into what it is now.

This program contains machine language, so be careful when typing it in. Be sure to save copies before running it, or you may experience full Basic crash, resetting your system and destroying the program in the process. (It is a good idea to save any program with POKEs or machine language before running it.)

To save time, and memory, you can leave out all the remarks and the instructions occupying lines 1020–1090.

To hook up the sound, either put the large gray plug for the cassette recorder into the input jack of an amplifier, or use your cassette recorder directly with an earphone or speaker.

To set up your recorder first take out any tape and press record and play while holding down the record tab micro switch in the top left corner inside the cassette compartment. Then remove all the plugs from their jacks and put the large gray plug into the auxiliary jack. Then take an earphone or speaker and plug it into the ear jack. You will now be able to hear sound when the game is run.

To control your ship, use the greater-than and less-than keys (<and>) to move left and right. To shoot, use the numeric keys 1–6 on the numeric keypad or top row. Keys 2 and 5 fire straight down, 1 and 4 fire left, and 3 and 6 fire right. (They line up on the numeric keypad in the directions you are shooting.) Key 0 produces a force field, which vaporizes the objects immediately around you. For continuous movement or fire, keep the key pressed down.

When you start, you have 40 units of energy (displayed at the top of the screen). Each time you shoot you lose one unit of energy, but gain one unit each time you move down a line. The force field uses 10 units of energy, which means you should use it sparingly.

After reading the directions you will be asked if you want to start with fast speed. Press N to start with the slow speed, which is best for beginners. When playing at fast speed, you obtain double the points you would obtain with slow speed.

The first things you will come across are mines (#). They are worth two points. Next are torpedo launchers (A), which shoot torpedos (!) at you. They are worth 10 points. Then there are the sidemovers (H), which move sideways randomly. These are worth 20 points. Finally are the quick bombs, either up-arrows or left brackets, which pop up all over the screen. They are worth 10 points.

Program Listing

```
4 GOTO8800
8 '10-30: SCAN KEYS & JUMP TO SHIP CONTROL ROUTINES
10 A=PEEK(15136):B=PEEK(15120):C=C+1:IFC<GTHENIF0=A+BTHEN10ELSE3
0
20 GOTO40
30 IFA=16THEN200ELSEIFA=64THEN300ELSEIFE<1THENC=C+1:GOTO10ELSEIF
B=4THEND=64:GOTO410ELSEIFB=2THEND=63:GOTO410ELSEIFB=8THEND=65:GO
TO410ELSEIFB=16THEND=-1:GOTO450ELSEIFB=64THEND=1:GOTO450ELSEIFB=
32THEND=64:GOTO410ELSEIFB=1THEN150ELSEC=C+2:GOTO10
38 '40-70: COMPUTE TUNNEL WALLS & CHECK SHIPS STATUS
40 E=E+1:IFE>40THENE=40
50 I=I+RND(0)/7:J=J+RND(0)/8:K=SIN(I)*10+14:L=SIN(J)*10+26:POKEM
+26,K:POKEM+28,L:POKEM+77,E:IFO=1THENDEFUSR=&HBB9DELSEPOKE16526,
29
```

Listing continues

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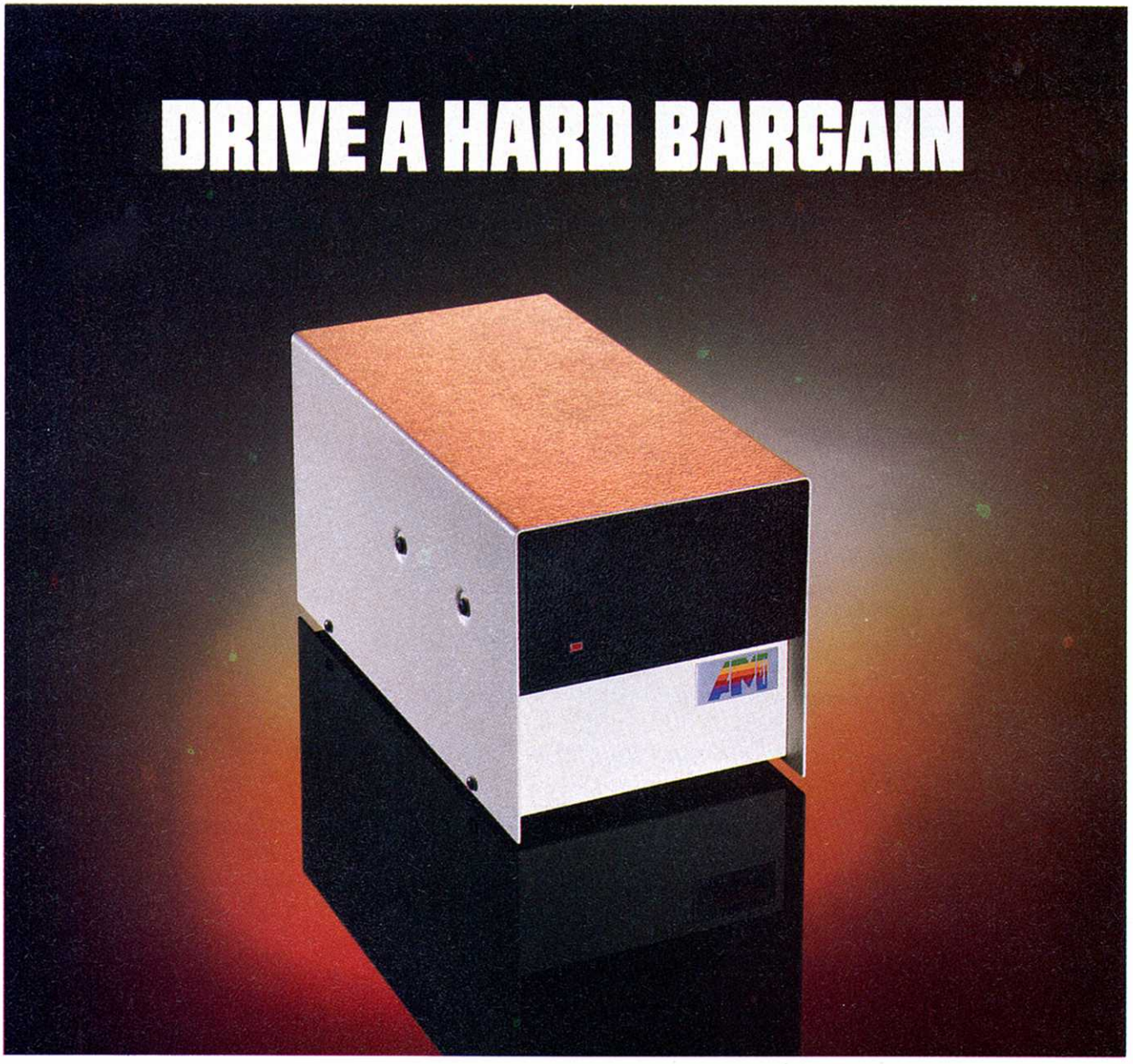
DRIVE A HARD BARGAIN



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Listing continued

```
60 C=PEEK(S+64):B=PEEK(S+65):A=PEEK(S+66):PRINT@S-F,"    ";:PRINT
@960,"":PRINT@S-F,"+O+";:X=USR(X)
70 PRINT@0,"ENERGY:";:PRINT@48,"POINTS:";P;:POKES+1,79:IFA=32AND
B=32ANDC=32THENC=0:GOTO84ELSE1600
78 '80-120: JUMP TO PROPER ENEMY WEAPON ROUTINE FOR PHASE
80 N=N+1:GOTO10
84 IFO=1THENDEFUSR=&HBB81ELSEPOKE16526,1
90 C=0:IFN>309THEN120ELSEIFN>208THEN800ELSEIFN>127THENIFN=128THE
N760ELSE700
100 IFN>48THENH=H+1:IFH=1THEN600ELSEIFH=2THEN610ELSEIFH<9THEN630
ELSEH=0:GOTO100
110 IFN>40THEN680ELSE510
120 IFN>319THEN920ELSEIFN=319THEN914ELSEIFN>314THEN900ELSEIFN>31
2THEN910ELSE900
148 '150-160: FORCE FIELD
150 IFE<10THENC=C+2:GOTO10ELSEA$=CHR$(131):B$=CHR$(140):PRINT@S-
F-7,CHR$(191)"      +O+      "CHR$(191);:PRINT@S-F+57,A$B$CHR$(1
76)STRING$(11,32)CHR$(176)B$A$;:PRINT@S-F+124,A$B$STRING$(7,176)
B$A$;
160 FORA=0TO9:OUT255,1:OUT255,2:NEXT:PRINT@S-F-7,"        +O+
   ";:PRINT@S-F+57,STRING$(17,32);:PRINT@S-F+124,STRING$(11,32);
:E=E-10:POKES+1,79:C=C+21:FORA=0TO9:NEXT:GOTO10
198 '200-300: MOVE SHIP LEFT-RIGHT
200 S=S-1:T=PEEK(S):PRINT@S-F,"+O+ ";:POKES+1,79:IFT=32THENC=C+1
:GOTO10ELSE1600
300 T=PEEK(S+3):PRINT@S-F," +O+";:POKES+2,79:S=S+1:IFT=32THENC=C
+1:GOTO10:ELSE1600
408 '410-440: SHOOT AT LOW ANGLE
410 E=E-1:W=S+D+1:POKEM,40:T=USR(8):T=PEEK(W):POKEW,46:IFT<>32TH
EN424
420 FORA=1TO13:W=W+D:T=PEEK(W):POKEW-D,32:POKEW,46:IFT=32THENNEX
T:POKEW,32:C=C+21:GOTO10
424 IFT=46THENP=P-9ELSEIFT=35THENP=P-8ELSEIFT=72THENP=P+10
430 IFT=153ORT=166THEN440ELSEPRINT@W-F-1,"***";:P=P+10:C=C+21:X=
RND(255):Y=256/X*(14-A):POKEM,X:T=USR(Y):PRINT@W-F-1,"    ";:GOTO
10
440 POKEW,42:OUT255,1:FORT=0TO9:NEXT:C=C+21:A=A*10:POKEW,32:FORD
=ATO130:NEXT:GOTO10
448 '450-490: SHOOT AT WIDE ANGLE
450 E=E-1:W=S+65+D+D:POKEM,44:T=USR(8):T=PEEK(W):POKEW,46:IFT<>3
2THEN474
460 FORA=1TO13:W=W+64+D+D:T=PEEK(W-D):IFT<>32THENW=W-D:POKEW-64-
D,32:GOTO474
470 T=PEEK(W):POKEW-64-D-D,32:POKEW,46:IFT=32THENNEXT:POKEW,32:C
=C+24:GOTO10
474 IFT=46THENP=P-9ELSEIFT=35THENP=P-8ELSEIFT=72THENP=P+10
480 IFT=153ORT=166THEN490ELSEPRINT@W-F-1,"***";:P=P+10:C=C+22:X=
RND(255):Y=256/X*(13-A)+1:POKEM,X:T=USR(Y):PRINT@W-F-1,"    ";:GO
TO10
490 POKEW,42:FORT=0TO9:NEXT:C=C+22:A=A*20:POKEW,32:FORD=ATO130:N
EXT:GOTO10
508 '510: MINE ROUTINE
510 FORT=1TO2:POKERND(L)+K+959+F,35:NEXT:FORT=0TO9:NEXT:GOTO80
540 '(C)1981-MICHAEL J.LAKE
                                598 '600-680: TORPEDO ROUTINE
600 U=RND(L/2-4)*2+K+963+F:V=RND(L/2-4)*2+K+963+F:IFU=VTHEN600EL
SEPOKEU,65:POKEV,65:U=U-64:V=V-64:GOTO80
610 POKERND(L)+K+959+F,46:T=PEEK(U):U=U-128:IFT=65THENPOKEU+64,3
3
620 T=PEEK(V):V=V-128:IFT=65THENPOKEV+64,33:GOTO80
630 POKERND(L)+K+959+F,46:T=PEEK(U):IFT=33THENA=PEEK(U-64):IFA=3
2THENPOKEU,32:POKEU-64,33
640 T=PEEK(V):IFT=33THENB=PEEK(V-64):IFB=32THENPOKEV,32:POKEV-64
,33
650 U=U-128:V=V-128:GOTO80
680 POKERND(L)+K+959+F,46:GOTO80
698 '700-760: SIDEMOVER ROUTINE
700 POKERND(L)+K+959+F,46:IFO=1THENDEFUSR=&HBBE9ELSEPOKE16526,10
5
710 FORU=0TO3:V=A%(U):V=USR(V):IFV>127+FTHEN730ELSET=PEEK(V):IFT
=32THEN730ELSEIFT<>72THEN730ELSEIFV<STHENA=1ELSEA=-1
720 FORB=1TO8:V=V+A:T=PEEK(V):IFT=43THENB=8:NEXT:GOTO1600ELSEPOK
EV-A,32:POKEV,72:NEXT
730 IFV<F+64THENPRINT@K+960,STRING$(L,32);:V=INT(L*.5)+K+960+F:P
OKEV,72
740 V=V-64:A%(U)=V:NEXT:N=N+1:IFO=1THENDEFUSR=&HBB81ELSEPOKE1652
6,1
750 GOTO80
760 A%(0)=16320:A%(1)=16064:A%(2)=15808:A%(3)=15552:GOTO80
798 '800-820: QUICK BOMB ROUTINE
800 POKERND(L)+K+959+F,46
810 V=RND(824)+196+F:T=PEEK(V):IFT=32THENPOKEV,91:ELSE810
820 GOTO80
898 '900-970: END OF TUNNEL - DOCKING ROUTINE
900 FORT=0TO9:NEXT:GOTO80
910 PRINT@960+K,STRING$(L,PEEK(16610));:GOTO80
914 POKERND(L-10)+K+962+F,89:GOTO80
920 PRINT@960+K,STRING$(L,151);:IFN<>332THEN80ELSET=PEEK(S+65):P
```

Listing continues

After going through the quick bombs, you must blast through a wall and dock. This is tricky, but you could use the force field to make a quick, easy opening. To dock with the docking port (Y), be sure you are centered directly above it. You get 200 points for docking and five points for each unit of energy you have left. You can then start again, keeping your score and gaining more points.

Your game ends when you crash or miss docking. If you have a high score, you will asked for your name. Then you will be asked if you want a printout of your score; if so, press P, get your printer ready, and press Y.

You can press E to end the game, D to see the directions, or another key to start you playing again.

Correcting Errors

If, while you are playing the game, the computer suddenly displays Memory Size?, reboots the DOS, or hangs up, then something is wrong with the data statements, USRs, POKEs, or other related function. This also might be the problem if the sounds don't work correctly, the tunnel is drawn strangely or the sidemovers don't work. To correct these problems start by checking lines 2000–8800 for errors. If you spot no problems, check the rest of the program starting from the beginning.

How This Game Works

By looking at the listing you might think this program is poorly structured. When it was first written, it was correctly structured, but because of upgrades, some of the design logic was lost.

I have included comments in the listing that describe what various lines do. All the single-letter variables are used for the program, as well as variables, A%, H%, H!, XX, A$, and N$.

I included some machine-language subroutines in the program to speed up a few functions. These routines draw the walls, show the energy, move the sidemovers, and make the music.

To protect the routines in high memory without answering the memory-size question, I POKEd the address of where the machine language is to start into locations 16561 and 16562. Then to reset other internal Basic registers I used a clear statement. Then the routines are POKEd into protected memory. ■

Michael John Lake, age 15, can be reached at 5486-F Jamison St., Fort Knox, KY 40121.

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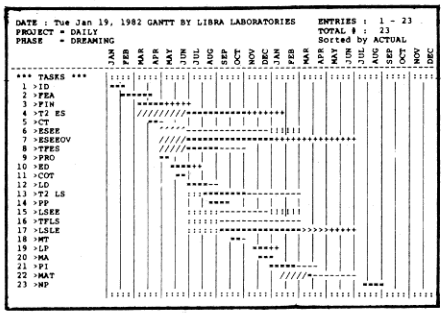

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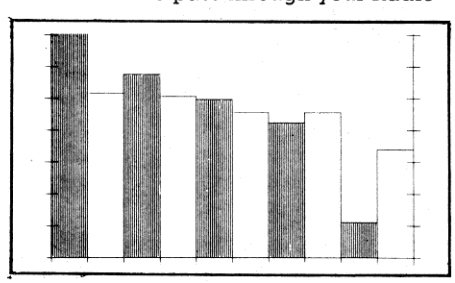

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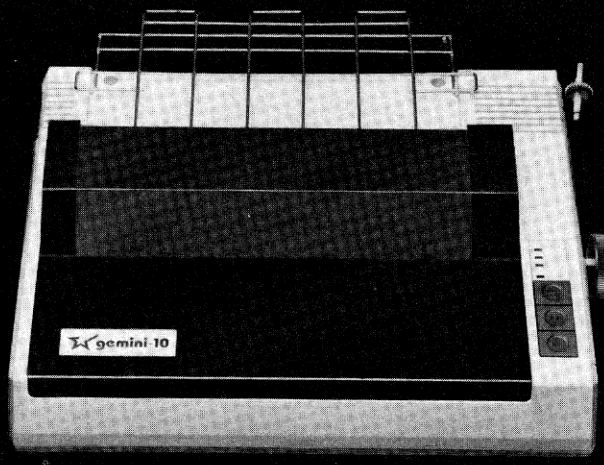
Listing continued

```
=P+E*5:R=R+1
930 FORU=0TO9:PRINT@256,CHR$(31)CHR$(23)"YOU MADE IT!";:POKEM,44
:A=USR(80):PRINTCHR$(28);:FORV=0TO9:NEXT:NEXT:PRINT@280,"- BUT D
IDN'T DOCK, SORRY.";:IFT=89THENPRINT@280,"- AND DOCKED SAFELY TO
O !";:P=P+200
940 IFG=22THENPRINT@384,"YOUR SCORE IS DOUBLE AT FAST SPEED.";:P
=P*2
950 PRINT@54,P;:Q=Q+P:PRINT@512,"YOUR TOTAL POINTS SO FAR ARE -"
;Q;"AFTER";R;"RUNS";:GOSUB1400
960 IFT<>89THEN1640
970 PRINT@896,"PRESS 'S' TO STOP, ANOTHER KEY TO CONTINUE.":GOSU
B1200:IFA$="S"THEN1640ELSE1100
998 '1004-1010: PROGRAM SIGN ON
1004 ONERRORGOTO0:CLS:GOSUB8400:PRINTCHR$(28);:S=158
1006 FORP=1TO14:PRINT@S-64,"   ";:PRINT@S,"+O+";:OUT255,1:OUT255
,2:FORB=0TO99:NEXT:S=S+64:NEXT:S=990:FORP=1TO14:S=S-64:PRINT@S+6
4,"   ";:PRINT@S,"+O+";:OUT255,1:OUT255,2:FORN=0TO99:NEXT:NEXT
1010 GOSUB8410:GOSUB1110:PRINT@896,"DO YOU WANT TO SEE THE DIREC
TIONS ?";:GOSUB1200:IFA$="N"THEN1096
1018 '1020-1090: DIRECTIONS
1020 PRINT@388,CHR$(31)"YOUR MISSION IS TO GO DOWN A WINDING TUN
NEL, DESTROY ALL THEWEAPONS YOU COME ACROSS, AND DOCK WITH THE D
OCKING PORT AT THE  BOTTOM SO A TEAM OF TRAINED PERSONNEL CAN DE
STROY THE EVIL BASE.":GOSUB1110
1030 PRINT@64,CHR$(31)STRING$(62,140);:PRINT@704,STRING$(62,140)
;:PRINT@194,STRING$(40,45)"   "STRING$(15,45);
1040 FORP=5TO33:SET(0,P):SET(1,P):SET(86,P):SET(87,P):SET(122,P)
:SET(123,P):NEXT:PRINT@130,"DISPLAYED OBJECTS :";:PRINT@173,"CON
TROL KEYS :";:A$=" - WORTH ":B$=" POINTS "
1050 PRINT@258,"'#' MINE"A$"2"B$"SHOT";:PRINT@322,"'!' TORPEDO"A
$"10"B$;:PRINT@386,"'A' TORPEDO LAUNCHER"A$"10"B$;:PRINT@450,"'H
' SIDE MOVER"A$"20"B$;:PRINT@514,"'[' QUICK BOMB"A$"10"B$;:PRINT
@578,"'.' MINI MINE"A$"1"B$;
1054 PRINT@642,"'Y' DOCKING PORT-WORTH 200"B$"DOCKED";
1060 PRINT@301,"< - MOVE LEFT";:PRINT@365,"> - MOVE RIGHT";:PRIN
T@429,"0 - FORCE FIELD";:PRINT@493,"FIRE DIRECTIONS";
1070 PRINT@561,CHR$(176)"4 5 6"CHR$(176);:PRINT@622,CHR$(176)CHR
$(140)CHR$(131)CHR$(160)"1 2 3"CHR$(144)CHR$(131)CHR$(140)CHR$(1
76);:PRINT@685,CHR$(131)"  "CHR$(152)CHR$(129)"  "CHR$(191)"  "C
HR$(130)CHR$(164)"  "CHR$(131);
1074 PRINT@772,"LOOK AT THE DATA ABOVE.  IT SHOWS HOW TO CONTROL
 YOUR SHIP &SHOWS THE DIRECTIONS YOUR GUN FIRES ( KEY 6 FIRES RI
GHT-DOWN ). YOU START WITH 40 UNITS OF ENERGY, AND EACH SHOT USE
S UP ONE.";:GOSUB1110
1080 PRINT"YOU GAIN 1 UNIT OF ENERGY PER SECOND, SO PLAN YOUR SH
OTS.  THE  FORCE FIELD USES UP 10 UNITS OF ENERGY, USE IT SPARIN
GLY.  YOUR SHIP,'+O+', WILL BE DESTROYED IF YOU CRASH, SO BE CAR
EFUL.";:GOSUB1110
1090 PRINT"FOR SOUND CONNECT THE LARGE GRAY PLUG TO AN AMPLIFIER
.  YOU CAN START PLAYING.  GOOD LUCK !";:GOSUB1110
1094 '1096-1100: START TUNNEL RUN
1096 F=15360:G=44:Q=0:R=0:XX=0:CLS:PRINT"WOULD YOU LIKE TO START
 WITH FAST SPEED ?";:GOSUB1200:IFA$="Y"THENG=22
1100 E=40:S=90+F:N=0:I=0:J=0:P=0:H=0:POKE16610,46:CLS:PRINT@0,ST
RING$(64,95);:FORA=0TO23:PRINT@A,CHR$(95)"."STRING$(4,188)CHR$(1
91)CHR$(157);:PRINT@A+66," +O+";:FORB=1TO20:OUT255,RND(2):NEXT:N
EXT:FORA=0TO999:NEXT:GOTO80
1108 '1110-1210: INKEY$ ROUTINES
1110 PRINT@976,"---- PRESS ANY KEY TO GO ON ----";:A$=INKEY$
1120 A$=INKEY$:IFA$=""THENX=RND(255):POKEM,X:Y=USR(8):GOTO1120EL
SEPRINT@768,CHR$(31);:RETURN
1200 A$=INKEY$
1210 A$=INKEY$:IFA$=""THEN1210ELSERETURN
1398 '1400-1580: GAME COMMENTS
1400 IFQ<500THENPRINT@640,"MAYBE YOU SHOULD READ THE INSTRUCTION
S!";
1410 IFQ>499ANDQ<1000THENPRINT@640,"GOOD START FOR A TRAINEE!";
1420 IFQ>999ANDQ<2000THENPRINT@640,"YOU ARE DOING OK...SO FAR!";

1430 IFQ>1999ANDQ<4000THENPRINT@640,"TRY TO MAKE 4000, AND HEAR
SOME MUSIC.";ELSEIFXX=-1THENFORA=0TO99:POKERND(64)+15999,RND(255
):OUT255,RND(2):NEXT:FORA=0TO999:NEXT:PRINT@640,STRING$(64,32);
1440 IFQ>15999THENIFXX=0THENPRINT@640,"DIVE, DIVE, DIVE TO THE B
OTTEM OF THE SEA ;":PRINT"SO YOU MIGHT HAVE VICTORY -":PRINT"PRO
JECT DEEP DIVE IS ITS NAME ;":PRINT"AND ITS GONNA DRIVE YOU INSA
NE !";
1450 IFQ<4000THENRETURNELSEXX=XX+1:IFXX<>1THEN1470ELSEXX=-1:REST
ORE:FORP=0TO163:READB:NEXT:FORP=0TO30:READX,B:V=40:IFINT(X/2)<>X
/2THENX=X-1:V=80
1460 Y=256/X+V:POKEM,X:Y=USR(Y):FORV=0TOB*2:NEXT:NEXT:PRINT@640,
CHR$(31);
1470 IFQ>5999ANDQ<10000THENPRINT@640,"YOU ARE DOING GREAT! LETS
TRY FOR 10,000!";
1480 IFQ>9999ANDQ<16000THENPRINT@640,"LETS GO FASTER NOW!";:G=22

1490 IFQ>19999ANDQ<30000THENPRINT@640,"YOU MUST HAVE PRACTICED B
EFORE!";
1500 IFQ>29999ANDQ<50000THENPRINT@640,"KEEP ON GOING, TRY FOR 1,
```

Listing continues



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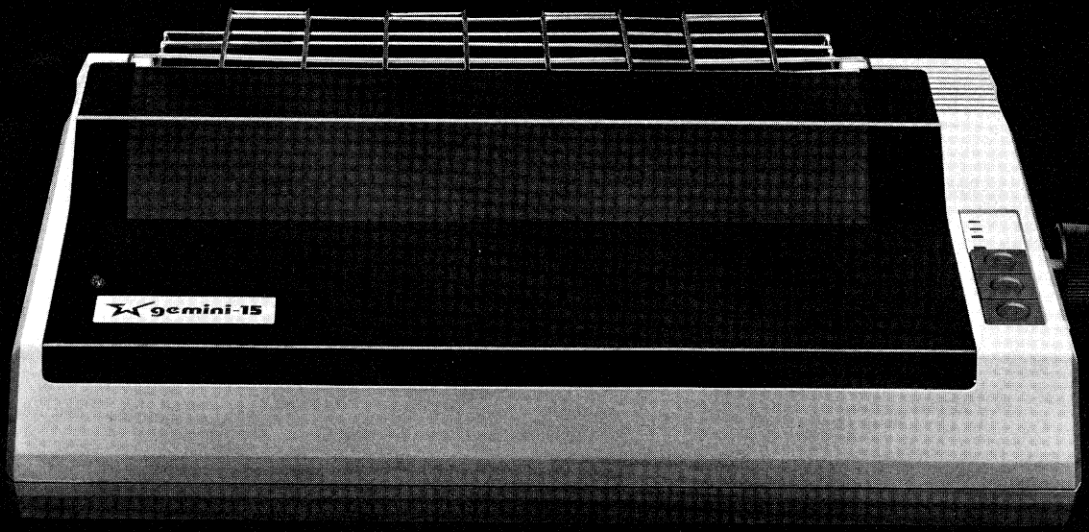

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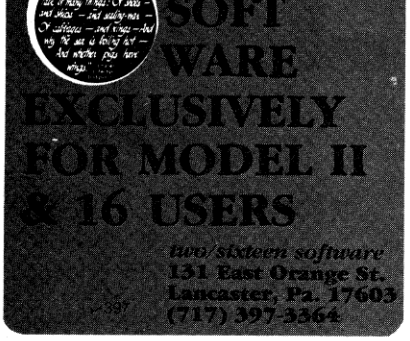

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Listing continued

```
000,000";
1510 IFQ>49999ANDQ<75000THENPRINT@640,"THIS IS INSANE!";
1520 IFQ>74999ANDQ<100000THENPRINT@640,"YOUR FRIENDS WILL BE SUP
RISED!";
1530 IFQ>99999ANDQ<250000THENPRINT@640,"VERY FEW PEOPLE GET THIS
 FAR!";
1540 IFQ>249999ANDQ<500000THENPRINT@640,STRING$(30,33):FORP=0TO9
99:NEXT:PRINT@640,"THIS MIGHT BE A RECORD SCORE!";
1550 IFQ>499999ANDQ<1000000THENFORP=33TO42:PRINT@640,STRING$(52,
P):FORB=0TO99:NEXT:NEXT:PRINT@640,"I THINK YOU CAN MAKE IT TO 10
00000 - A RECORD SCORE!";
1560 IFQ>999999THENFORP=33TO191:PRINT@640,STRING$(128,P)STRING$(
128,P);:X=255-P:POKEM,X:Y=256/X*4:Y=USR(Y):NEXT:GOTO1580
1570 RETURN
1580 PRINT@640,CHR$(31)CHR$(23)"YOU HAVE MADE A RECORD SCORE!":P
RINT"YOU HAVE OVER 1,000,000 POINTS!"CHR$(28);:FORP=0TO999:NEXT:
GOTO1640
1598 '1600-1630: SHOW SHIP CRASH
1600 IFO=1THENDEFUSR=&HBB81ELSEPOKE16526,1:POKE16527,125
1604 S=S-F:A$=CHR$(191):PRINT@S,CHR$(138)A$CHR$(133);:POKEM,40:Y
=USR(8):B$=STRING$(2,191):PRINT@S,CHR$(175)A$CHR$(159);:POKEM,80
:Y=USR(20):PRINT@S-1,STRING$(5,191);:PRINT@S+64,STRING$(3,131);:
POKEM,100:Y=USR(40):PRINT@S-2,STRING$(7,191);
1610 PRINT@S+62,CHR$(130)CHR$(139)STRING$(3,143)CHR$(135)CHR$(12
9);:POKEM,120:Y=USR(80):PRINT@S-3,STRING$(9,191);:PRINT@S+61,CHR
$(130)CHR$(139)CHR$(175)A$B$CHR$(159)CHR$(135)CHR$(129);:POKEM,1
60:Y=USR(60)
1620 PRINT@S-3,B$STRING$(2,157)A$STRING$(2,174)B$;:POKEM,200:Y=U
SR(8):PRINT@S-3,CHR$(157)CHR$(153)CHR$(157)CHR$(153)A$CHR$(166)C
HR$(174)CHR$(166)CHR$(174);:PRINT@S+63,CHR$(167)CHR$(182)A$CHR$(
185)CHR$(155);:POKEM,250:Y=USR(8)
1630 PRINT@256,CHR$(31)"WATCH OUT FOR OBJECTS, ONE JUST DESTROYE
D YOUR SHIP !";:T=0:GOTO940
1638 '1640-1650: END OF GAME - HIGH SCORE
1640 PRINT@960,CHR$(23)"HIGH SCORE:"CHR$(28);:PRINT@982,N$" -";H
!;"POINTS";HR;"RUNS";:IFQ>H!THENPRINT@768,"YOUR SCORE IS THE HIG
HEST, WHAT IS YOUR NAME";:INPUTN$:H!=Q:HR=R
1650 FORU=0TO9:PRINT@960,CHR$(31);:FORB=0TO99:NEXT:PRINT@960,CHR
$(23)"HIGH SCORE:"CHR$(28);:PRINT@982,N$" -";H!;"POINTS";HR;"RUN
S";:POKEM,160:Y=USR(8):NEXT
1658 '1660-1680: SCREEN PRINTOUT (CHANGES GRAPHICS & PRINTS)
1660 PRINT@896,"PRESS 'P' TO MAKE A PRINTOUT, ANOTHER KEY TO CON
TINUE";:GOSUB1200:IFA$<>"P"THEN1690ELSEPRINT@896,"PRINTER READY?
"STRING$(38,32);:GOSUB1200:IFA$<>"Y"THEN1660ELSEPRINT@896,STRING
$(52,32);:T=0:FORP=0TO1023
1670 B=PEEK(P+F):IFB=138THENB=73ELSEIFB=151THENB=84ELSEIFB>127TH
ENB=88ELSEIFB<32THENB=B+64
1680 LPRINTCHR$(B);:T=T+1:IFT=64THENLPRINT:T=0:NEXT:GOTO1660ELSE
NEXT
1690 PRINT@896,"PRESS 'E' TO END,'D' FOR DIRECTIONS, ANOTHER KEY
 TO PLAY AGAIN";:GOSUB1200:IFA$="E"THENPOKE16396,201:ENDELSEIFA$
="D"THEN1004ELSE1096
1998 '2000-2260: MACHINE LANGUAGE & MUSIC DATA
2000 FORX=0TO225:READB:A=A+B:NEXT:IFA<>21201THENPRINT:PRINT"ERRO
R-CHECK DATA":POKE16396,201:END
2010 RESTORE:FORX=0TO163:READB:POKEM+X-4,B:NEXT:GOTO1004
2200 DATA 205,127,10,14,4,65,62,1,211,255,181,62,2,16,251,43,65,
62,2,211,255,124,181,16,252,32,234,201
2210 DATA 217,6,4,14,4,62,1,211,255,30,64,58,226,64,33,192,63,11
9,35,29,16,251,54,32,35,29,13,32,249,119,35,29,32,251,33,226,64,
214,153,40,4,54,153,24,2,54,166
2220 DATA 6,57,33,7,60,62,4,230,255,40,7,54,138,35,5,61,32,249,5
4,32,35,16,251,62,2,211,255,217,201
2230 DATA 205,127,10,126,214,72,32,25,237,95,230,3,40,19,71,237,
95,230,1,40,15,54,32,43,126,214,32,32,21,54,72,16,244,195,154,10
,54,32,35,126,214,32,32,11,54,72,16,244
2240 DATA 24,239,35,54,72,24,234,43,54,72,24,229
2250 DATA 189,40,189,40,189,40,146,40,170,40,198,0,206,40,146,20
,170,20,207,80,135,40,146,40,171,40,100,40,135,0,146,0,207,80,10
0,0,66,40,135,40,101,40,134,40,188,40,67,80
2260 DATA 135,40,189,40,170,40,101,40,147,40,101,0,67,255
6998 '7000-8030: CHECK FOR DISK BASIC AND SET MEMORY SIZE VALUE
7000 ONERRORGOTO7010:DEFUSR=&HBB81:O=1:GOTO8030
7010 O=0:POKE16526,1:POKE16527,125:RESUME8030
8030 POKE16610,O:IFO=1THENPOKE16561,128:POKE16562,187ELSEPOKE165
61,0:POKE16562,125
8038 '8040: SET UP PROGRAM VARIABLES
8040 CLEAR400:DEFINTA-H,K,L,N-P,R-Z:C=0:B=0:S=0:T=0:U=0:V=0:F=15
360:O=PEEK(16610):IFO=1THENM=-17531ELSEM=32005
8050 GOTO2000
8400 PRINTCHR$(23)"  (((( PROJECT DEEP DIVE ))))";:RETURN
8410 PRINT@448,"(C) COPYRIGHT 1981 -- MICHAEL JOHN LAKE ++";:RET
URN
8420 'FOR FURTHER INFORMATION CALL (502) 942-0722 OR WRITE:
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5486 F JAMISON ST.
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8800 CLS:RANDOM:POKE16396,175:POKE16397,201:GOSUB8400:GOTO7000
```

SCRINPUT

(outline #1 in a series)

SCRINPUT, (SCReen INPUT), is a fully relocatable 908 byte machine language routine that replaces the BASIC INPUT statement. Instead of entering data one item at a time, SCRINPUT allows you to create a video form on the screen of your disk based Radio Shack TRS-80 Model 1 or 3. Data entry is then a simple matter of filling in the blanks. Up to 80 "data fields" can be created on one video screen. Each field is assigned a length, screen position and one or more data types: Upper case alpha, lower case alpha, numeric or punctuation. Only characters matching type specifications can be placed in the field.

After defining data fields and specifying screen information, (Caps lock, Case reversal, cursor symbol and initial cursor location are among the features that can be activated), SCRINPUT is called via the BASIC USR function.

A flashing cursor symbol indicates where keyboard entered data will appear. As each character is entered, the cursor moves right one position. At the end of a data field, SCRINPUT repositions the cursor to the start of the next field. Keystrokes of invalid type are ignored.

Arrow keys can be used to move the cursor from one data field to another. Error correction is a simple matter of overtyping the bad characters with new data. The whole process is very similar to traditional screen oriented word processors.

SCRINPUT assigns all data fields to standard BASIC variables. These can be handled by your BASIC program in the same manner as information gathered by INPUT. You can even include error checking to insure that information is within reasonable bounds.

Be warned! SCRINPUT is only a utility and is designed for use within BASIC programs. If you cannot program, you can't use SCRINPUT. SCRINPUT works with any Disk Operating System (DOS) and comes with a 65 page manual containing sample programs, instructions and suggestions. Flow charts and source code are also included.

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Music Composer

by Carl Huben
First Place
11–13

The lack of programs using the Color Computer's sound function is very disappointing. But I've come up with a program to use this interesting capability. This program is easy to use—it's even simpler than playing Beethoven's Fifth on a touch-tone telephone.

My program allows you up to 200 notes, with features such as save on tape, retrieve from tape, forward or backward play, editing, and the highlight of the programs, three keyboards.

How It Works

When first run, you are presented with four options. The first lets you recall sound from the tape, while the others specify the three keyboards.

The first of these keyboards, the piano keyboard, is set up like a real one, except in three rows.

On this scale, the letter T is middle C. This keyboard allows you five octaves, excluding sharps and flats. The first octave uses the keys E to O, going across. The next octave is from keys P to H. The keyboard continues in this manner. (You use the semi-colon, comma, and period keys to produce notes.)

One major drawback of this keyboard is its slowness. There is a delay between when you press a key and when the note is produced. The delay is most apparent in the highest octaves. When you press a key, the program searches through data to locate it, and then reads the number that represents that key. After that, it will produce a tone of the desired pitch. It will take the computer longer to reach the last keys than the first keys, because that is the order they are in in the data statements. This delay is not present on the replay.

An advantage of this keyboard is its order, which can be helpful.

The next two keyboards are essentially the same. These are the A–Z and Z–A keyboards. These are much faster than the first, but lack the order present in the other. You only use the letter keys for these scales.

After typing out your great composition, you'll want to play it back. Just press the space bar. After entering whether you want forward or reverse play, your song will be played back, note for note (including the pauses between each note).

The program will ask if you want to edit the music that you've created. If you decide to, you will be asked the tones you want replayed. This is offered as a convenience for those who want to track down the sour note. Afterwards, you are presented with three choices: make changes, replay previously selected tones, or respecify replay numbers.

Program Listing

```
10 CLS:PRINTTAB(9) "MUSIC COMPOSER"
20 PRINT :PRINT : PRINT : PRINT"(1) LOAD MUSIC FROM TAPE" : PRIN
T"(2) PIANO KEYBOARD" : PRINT"(3) A-Z SCALE KEYBOARD" : PRINT"(4
) Z-A SCALE KEYBOARD"
30 PRINT@64,; : INPUT"ENTER CHOICE";A
40 ON A GOTO 60,190,340,470
50 GOTO 30
60 CLS : PRINT : INPUT"HOW MANY FILES OF MUSIC PRIOR TOTHE DESIR
ED ONE";B:IFB=0THEN 120
70 PRINT : PRINT"PRESS PLAY ON THE TAPE-DECK"
80 FORC=1 TO B : OPEN "I",-1,"MUSIC"
90 IF EOF(-1) THEN RUN 100
100 INPUT #-1,A$
110 GOTO 90 : NEXT
120 DIM T(200),S(200):PRINT"LOADING SOUND"
130 OPEN "I",-1,"MUSIC"
140 INPUT#-1,L
150 INPUT#-1,XX
160 IF EOF(-1) THEN 500
170 INPUT #-1,T(Z),S(Z)
180 Z=Z+1 : GOTO 160
190 GOSUB 680 : CLS : XX=0
200 TIMER=0
210 M$=INKEY$ : IF M$="" THEN 210
```

Listing continues

Variable	Description
L	Note length
S( )	Pause between stored notes
T( )	Stored notes
XX	Present keyboard mode
Z	Current number of note

Table 1. Variables

The Key Box

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Listing continued

```
220 IF ASC(M$)=32 THEN 500
230 S(Z)=TIMER
240 READ Y$,Y : IF Y$=M$ THEN 270
250 IF Y$="." THEN RESTORE : GOTO 200
260 GOTO 240
270 T(Z)=Y : RESTORE
280 PRINT@128,Z;"NOTES PLAYED,";200-Z;"NOTES":PRINT"REMAINING"
290 IF Z=199 THEN 480
300 Z=Z+1
310 SOUND Y,L
320 GOTO 200
330 DATA Q,5,W,32,E,58,R,78,T,89,Y,108,U,125,I,133,O,147,P,159,A
,159,S,170,D,176,F,185,G,193,H,197,J,204,K,210,L,216,;,218,Z,223
,X,227,C,229,V,232,B,236,N,238,M,239,",",242,.,244
340 GOSUB680 : CLS : XX=1
350 TIMER=0
360 M$=INKEY$ : IF M$="" THEN 360
370 IF ASC(M$)=32 THEN 500
380 S(Z)=TIMER
390 IF M$>"Z" OR M$<"A" THEN 350
400 IF XX=2 THEN E=255-((ASC(M$)-65)*9.8) ELSE E=((ASC(M$)-65)*9
.8)+1
410 SOUND E,L
420 T(Z)=E
430 Z=Z+1
440 PRINT@128,Z;"NOTES PLAYED";200-Z;"NOTES":PRINT"REMAINING"
450 IF Z=200 THEN 480
460 GOTO 350
470 GOSUB 680 : CLS : XX=2 : GOTO 350
480 PRINT"YOU HAVEN'T ANY MORE NOTES"
490 FOR B=1 TO 800 : NEXT
500 CLS : PRINT : INPUT"DO YOU WANT FORWARD OR BACKWARDSPLAYBACK
 (1 OR 2)";J : ON J GOTO 510,530
510 FOR N=0 TO Z-1:PRINT@128,"NOTES #"N+1:SOUND T(N),L : FOR K=1
 TO 7.6666*S(N): NEXTK,N
520 GOTO 540
530 FORN=Z-1 TO 0 STEP -1 : PRINT@128,"NOTE #"N+1:FOR O=1 TO S(N
)*7.6666 : NEXT O:SOUNDT(N),L:NEXT N
540 CLS : PRINT :INPUT"DO YOU WANT IT PLAYED BACK";P$ : IF P$="Y
ES" THEN INPUT"FORWARD OR BACKWARDS";Q$ ELSE 560
550 IF Q$="FORWARD" THEN 510 ELSE530
560 INPUT"DO YOU WANT TO EDIT IT";X$ : IF X$="YES" THEN 740
570 INPUT"DO YOU WANT TO SAVE THE MUSIC TOTAPE";U$ : IF U$="YES"
 THEN 580 ELSE RUN
580 CLS : PRINT : PRINT"PRESS PLAY AND RECORD":PRINT : PRINT"HIT
 ANY KEY TO SAVE SOUND"
590 IF INKEY$="" THEN 590
600 OPEN "O",-1,"MUSIC"
610 PRINT#-1,L
620 PRINT #-1,XX
630 FOR H=1 TO Z : PRINT #-1,T(H),S(H) : NEXT
640 CLOSE -1
650 PRINT : PRINT"FINISHED" : PRINT : PRINT"HIT ANY KEY TO RETUR
N"
660 IF INKEY$="" THEN 660
670 RUN
680 CLS : PRINT : DIMS(200),T(200)
690 CLS : PRINT:INPUT"ENTER TONE DURATION (1 FOR EVERY.06 SECOND
)";L
700 IF L<1 OR L>255 THEN 690
710 PRINT : PRINT"PRESS ANY ANY KEY TO START MUSIC"
720 IF INKEY$="" THEN 720
730 RETURN
740 CLS : PRINT : INPUT"SPECIFY START NUMBER AND END    NUMBER O
F TONES";X1,X2
750 IF X1<1 OR X2>Z THEN 740
760 FOR X=X1-1 TO X2-1 : PRINT@128,"NOTE #"X+1 : SOUND T(X),L :
FOR P=1 TO 7.6666*S(X) : NEXT P,X
770 PRINT@256,"(1) MAKE CHANGES" : PRINT"(2) REPLAY NUMBERS" : P
RINT"(3) RESPECIFY REPLAY NUMBERS" : PRINT@192,; : INPUT"ENTER N
UMBER";YY:ON YY GOTO 780,760,740 : GOTO 770
780 PRINT@256,"(1) CHANGE A NOTE":PRINT"(2) EXTEND MUSIC":PRINT"
(3) DELETE NOTES":PRINT@192,;:INPUT"ENTER NUMBER";YY:ON YY GOTO
820,790,810 : GOTO 780
790 CLS : PRINT@128,"PRESS ANY KEY TO START"
800 IF INKEY$=""THEN800ELSE ON XX+1 GOTO 200,350,350
810 CLS :PRINT:INPUT"NUMBERS TO DELETE";Q1,Q2:Q2=Q2+1:FORJ=Q2 TO
 Z:T(Q1+(J-Q2))=T(J):S(Q1+(J-Q2))=S(J):NEXT:Z=Z-(Q2-Q1):GOTO490
820 CLS : PRINT:RESTORE : INPUT"NUMBER TO CHANGE";W : IF XX=1 TH
EN 890
830 FOR T=1 TO 29 : READ A$,X : PRINT@206,T
840 SOUND X,1 :Z$=INKEY$ : IF Z$=""THEN840
850 IF ASC(Z$)=32 THEN 870 ELSE NEXT
860 RESTORE :GOTO 830
870 T(W)=X : INPUT"DELAY (1-10)";P : S(W)=8*P
880 INPUT"DO YOU WANT TO EDIT ANOTHER";Q$ : IF Q$="YES" THEN740
ELSE 500
890 FOR T=1 TO 26
900 PRINT @206,T
910 SOUND T*9.8,1 : Z$=INKEY$ : IF Z$="" THEN 910
920 IF ASC(Z$)=32 THEN 940ELSENEXT
930 GOTO 890
940 T(W)=T*9.8
950 INPUT"DELAY (1-10)";R : S(X)=R*8
960 PRINT : INPUT"CARE TO EDIT ANOTHER";L$ : IF L$="NO" THEN 500
970 CLS : GOTO 770
```

Line	Purpose
10–50	Set up menu and input choice
60–180	Sound-loading routine
190–330	Piano keyboard function
340–470	A–Z and Z–A keyboards
480–490	Indicate no more notes
500–550	Play back music
560–570	Ask to edit and save
580–670	Save function
680–730	Subroutine to enter tone duration
740–970	Edit function

Table 2. Line Functions

Choosing to make changes gives you another three options: change a note, extend the music, or delete portions of your song. The program explains the extension and deletion of notes in your music.

The change-a-note function asks for the number of the note to change. You will then hear the lowest note in the keyboard you were in. Each time you press a key, the note gets higher, until you find the desired replacement note. Press the space bar, and it will be replaced. It will then ask the delay you want between this note and the next. You will then be forwarded to the playback mode so it can be played back.

Now you have your composition. You certainly don't want to lose the work of 10 or 20 minutes, so use the save-on-tape feature. When you're in the playback mode, say no to every question until it asks if you care to save on tape. Position your tape, and enter yes, then press any key to save.

After saving music on tape, you can use yet another feature, the loading function. When you enter this mode, you will be asked how many files of music are before the one you want. The program searches for your file, and loads it into memory.

The many options and features should provide hours of fun composing. Enjoy! ■

Carl Huben (age 11) can be reached at 6929 Lee Crest Drive, West Bloomfield, MI 48033.

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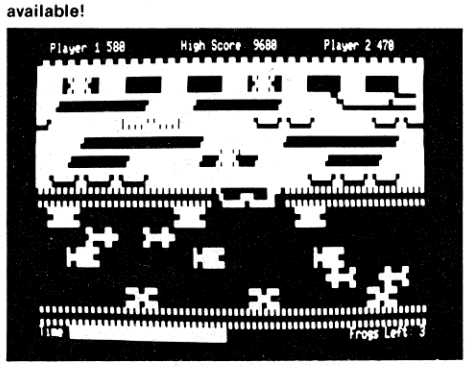

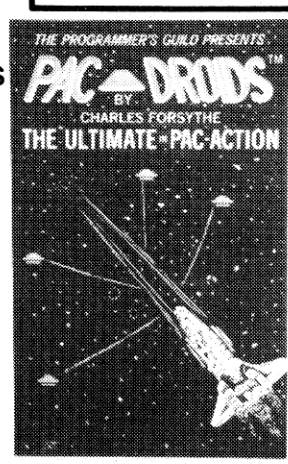

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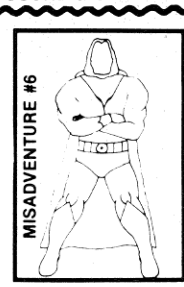

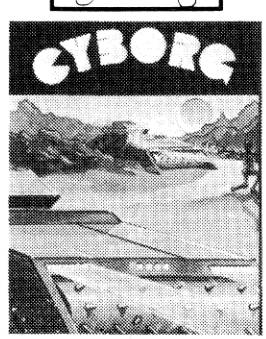

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NOTE: Radio Shack refused to include our first Misadventure [MADAM ROSA'S MASSAGE PARLOR] in their Sourcebook due to our description of the game! We appreciate the publicity - thanks!

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Super-Draw

by Terry Myerson
First Place
10 and under

Program Listing

```
0 REM *** A DRAWING PROGRAM CALLED SUPER-DRAW
5 REM *** BY TERRY JAY MYERSON KNOWN AS T.J.
7 REM *** AGE 10
8 REM *** 233 PINE CONE TRAIL ORMOND BEACH, FLORIDA 32074
10 POKE 16396,175:POKE 16397,77
20 CLS
30 FOR X=0 TO 127:SET(X,44):NEXT X
40 PRINT@960,"MODE: SKETCH";
50 FOR R=1 TO 221
60 READ X,Y
70 SET(X,Y)
80 FOR L=1 TO 5:NEXT L
90 NEXT R
100 PRINT@920,"by Terry Myerson"
110 FOR X=1 TO 15:IF S=0 THEN PRINT@960+21,"P R E S S  A N Y  K
E Y  T O  B E G I N"; ELSE PRINT@960+21,"
                    ";
120 A$=INKEY$:IF A$<>"" THEN GOTO 260
130 NEXT X
140 IF S=0 THEN S=1 ELSE S=0
150 GOTO 110
160 A$=INKEY$:IF A$="" THEN 160 ELSE GOTO 260
170 DATA 32,8,31,7,30,6,29,6,28,5,27,5,26,5,25,5,24,6,23,7,23,8,
22,9,22,10,23,11,24,11,25,11,26,11,27,11,28,11,29,11,30,11,31,12
,31,13,30,14,30,15,29,16,28,17,27,17,26,17,25,17,24,17,23,16,22,
16,21,15,20,14
180 DATA 37,11,36,12,35,13,35,14,35,15,35,16,36,17,37,17,38,17,3
9,17,40,17,40,16,41,15,42,14,43,13,43,12,43,11,43,15,43,16,44,17

190 DATA 48,11,48,12,48,13,48,14,48,15,48,16,48,17,48,18,48,19,4
8,20,48,21,48,22,49,12,50,11,51,11,52,11,53,11,54,11,55,11,56,12
,56,13,56,14,56,15,56,16,55,17,54,17,53,17,52,17,51,17,50,17,49,
16
200 DATA 60,14,61,14,62,14,63,14,64,14,65,14,66,14,67,14,68,14,6
9,14,68,13,67,12,66,11,65,11,64,11,63,11,62,11,61,12,60,13,60,15
,61,16,62,17,63,17,64,17,65,17,66,17,67,17,68,17,69,16
210 DATA 72,11,73,11,73,12,73,13,73,14,73,15,73,16,73,17,74,13,7
4,12,75,12,76,11,77,11,78,11,79,11,80,11,81,12,82,13,82,14
220 DATA 32,22,33,22,34,22,34,23,35,23,36,23,37,23,38,24,39,25,3
9,26,39,27,39,28,38,29,37,30,36,30,35,30,34,30,33,31,32,31,31,31
,31,30,31,29,31,28,31,27,31,26,31,25,31,24,31,23,31,22
230 DATA 42,26,42,27,42,28,42,29,42,30,42,31,43,27,44,27,44,26,4
5,26,46,26,47,26,48,26,49,27,50,28
240 DATA 60,26,59,27,59,28,59,29,59,30,60,31,58,27,57,26,56,26,5
5,26,54,26,53,27,53,28,53,29,53,30,54,31,55,31,56,31,57,31,58,30

250 DATA 67,26,67,27,66,28,65,29,65,30,66,31,67,31,68,31,68,30,7
0,29,71,28,71,27,71,26,69,30,69,31,70,31,71,31,72,31,73,30,74,29
,75,28,75,27,75,26
260 CLEAR 10000
270 ON ERROR GOTO 2110
280 CLS
290 PRINTTAB(20)"CHOOSE SKETCH SCREEN"
300 PRINTTAB(15)"USE ARROWS"
310 PRINT@448+32-3,"?  ";CHR$(143);"  ?";
320 PRINT@448+32-64,"?";
330 PRINT@448+32+64,"?";
340 N=PEEK(14440)
350 IFNAND8THENS=1
```

Listing continues

Super-Draw will make you and your TRS-80 creative. It lets you draw on the CRT, reproduce figures several times on the same screen, and save and recall drawings.

I wrote this program on a Model III with 48K and two disk drives. Only one disk drive is necessary to run the program, though, and you can use a joystick.

How to Use It

After the introduction to Super-Draw is finished, you can choose your sketch pad. The six possibilities are in Fig. 1.

For screen A, press the up arrow; for screen B, press the down arrow; for screen C, press the left arrow; and for screen D, press the right arrow.

For screens A–D, just press the arrow pointing to the part of screen you want white. For screen E, press any arrow, L (load), and then 0 (load 0). For screen F, press any arrow, L (load), and then 0 (load 0). When the computer is done, press C (convert).

Simple Drawing Techniques

To move the sketcher, use the arrow keys or the joystick. Hold down two arrow keys to draw diagonals.

To choose a new sketch screen or restart your drawing, press the space bar or the red button on the joystick.

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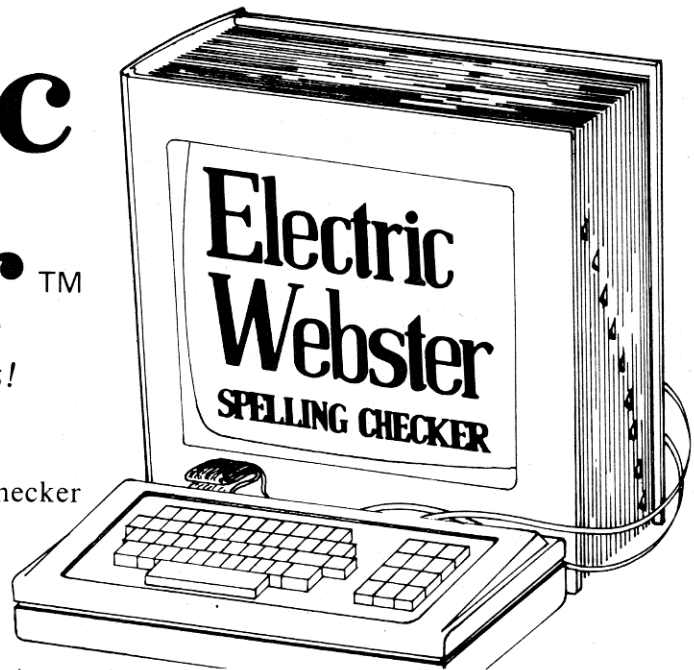

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Creative Computing, March 1982

"This is a very useful product and should be obtained by anyone who uses a word processor."
80 Microcomputing, August 1981

"The summary review of this program? One word—Excellent."
Computronics, September 1981

"In a comparative review of proofreading programs (with smaller dictionaries) MICROPROOF was found to be considerably faster than all the others, when tested against a 400 word sample document."
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"By far, the most capable and efficient of these spelling checker programs."
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To find out where the sketcher is, press enter and the sketcher will start blinking. To stop the blinking, press break.

Advanced Drawing Techniques

To erase or move to another place on the screen, press clear. Then move the eraser with the arrow keys or joystick. To exit, press enter or the red button on the joystick.

To change everything black to white and everything white to black, press C. To save a drawing, hit S and the drawing number (1–9). To load a drawing, hit L and the drawing number (1–9).

Creating and Using Functions

To create a function, type E while in

```
A.  ------------------------
    ! ***************!
    ! ***************!
    !               !
    !               !
    ------------------------

C.  ------------------------
    !*******        !
    !*******        !
    !*******        !
    !*******        !
    ------------------------

E.  ------------------------
    ! ***************!
    ! ***************!
    ! ***************!
    ! ***************!
    ------------------------

B.  ------------------------
    !               !
    !               !
    ! ***************!
    ! ***************!
    ------------------------

D.  ------------------------
    !        *******!
    !        *******!
    !        *******!
    !        *******!
    ------------------------

F.  ------------------------
    !               !
    !               !
    !               !
    !               !
    ------------------------
```

Figure 1. Six Screens

Listing continued

```
360 IFNAND16THENS=2
370 IFNAND32THENS=3
380 IFNAND64THENS=4
390 OUT236,16
400 A=255-INP(0)
410 IFAAND1THENS=1
420 IFAAND2THENS=2
430 IFAAND4THENS=3
440 IFAAND8THENS=4
450 IFS=0ORS>4THEN340
460 CLS
470 IFS=1THENFORX=0TO7:PRINT@64*X,STRING$(64,191);:NEXTX
480 IFS=2THENFORX=8TO14:PRINT@64*X,STRING$(64,191);:NEXTX
490 IFS=4THENFORX=0TO15:PRINT@64*X+32,STRING$(32,191);:NEXTX
500 IFS=3THENFORX=0TO14:PRINT@64*X,STRING$(32,191);:NEXTX:
510 FORX=0TO127:SET(X,44):NEXTX
520 PRINT@960,"MODE :SKETCH";STRING$(20,128);
530 IFS=1ORS=3THENX=64:Y=24
540 IFS=2THENX=64:Y=23
550 IFS=4THENX=63:Y=23
560 SET(X,Y)
570 POKE16396,175:POKE16397,201:N=PEEK(14440)
580 IFN=128THENGOTO 260
590 A$=INKEY$
600 IF A$="S" THEN GOTO 1100
610 IFA$="L"THENGOTO1300
620 IF A$="C" THEN GOTO 1790
630 IF A$="P" THEN GOTO 1990
640 IF A$="E" THEN GOTO 2130
650 GOSUB 1670
660 IFA=0ANDN=0THEN570
670 IFNAND8THENY=Y-1
680 IFNAND16THENY=Y+1
690 IFNAND32THENX=X-1
700 IFNAND64THENX=X+1
710 IFNAND1THEN3000
720 IFNAND4THENPOKE16396,195:POKE16397,77:GOTO 760
730 IFNAND2THEN910
740 GOSUB 1600:GOSUB 1530
750 GOTO570
760 PRINT@960,"MODE :FUNCTION LOAD","TYPE FUNCTION FILE NAME";
770 E1=X:F=Y
780 E=Y+11
790 A$=INKEY$:IF A$="" THEN 790
800 POKE 16396,195:POKE 16397,77
810 OPEN"I",3,"FUNC"+A$+"/FUC"
820 IF X>(127-35) THEN WQW
830 IF Y>(47-11) THEN GOTO 570
840 FOR X=X TO X+36:FOR H=Y TO E
850 INPUT#3,P
860 IF P=1 THEN SET(X,H) ELSE RESET(X,H)
870 NEXT H,X
880 CLOSE
890 X=E1:Y=F
900 F
910 PRINT@960,"MODE :SKIP & ERASE";STRING$(20,128);
920 F=PEEK(14440):A=255-INP(0)
930 IFF=0ANDA=0THEN920
940 IFFAND1ORAAND16THENPRINT@960,"MODE :SKETCH";STRING$(20,128);
:GOTO1760
950 GOSUB1020
960 IFFAND8ORAAND1THENY=Y-1
970 IFFAND16ORAAND2THENY=Y+1
980 IFFAND32ORAAND4THENX=X-1
990 IFFAND64ORAAND8THENX=X+1
1000 GOSUB1600
1010 GOSUB1530:GOTO920
1020 IFS=1THENIFY<24SET(X,Y)ELSERESET(X,Y)
1030 IFS=2THENIFY>23SET(X,Y)ELSERESET(X,Y)
1040 IFS=3THENIFX<64SET(X,Y)ELSERESET(X,Y)
1050 IFS=4THENIFX<64RESET(X,Y)ELSESET(X,Y)
1060 IF S=5 THEN SET(X,Y)
1070 IF S=6 THEN RESET(X,Y)
1080 RETURN
1090 E=X:F=Y
1100 PRINT@960,"MODE :SAVE";STRING$(20,128);:L=PEEK(15360):POKE1
5360,35
1110 A$=INKEY$
1120 A=VAL(A$)
1130 IFA<1ORA>9THEN1110
1140 PRINT@960,"MODE :SAVE              DRAWING #";A$;
1150 POKE 16396,195:POKE 16397,77
1160 OPEN"O",1,"DRW"+A$+"IG"+"/DAT"
1170 PRINT#1,S;",";
1180 PRINT#1,X;",";
1190 PRINT#1,Y;",";
1200 POKE15360,L
1210 FORX=15360TO16383
```

Listing continues

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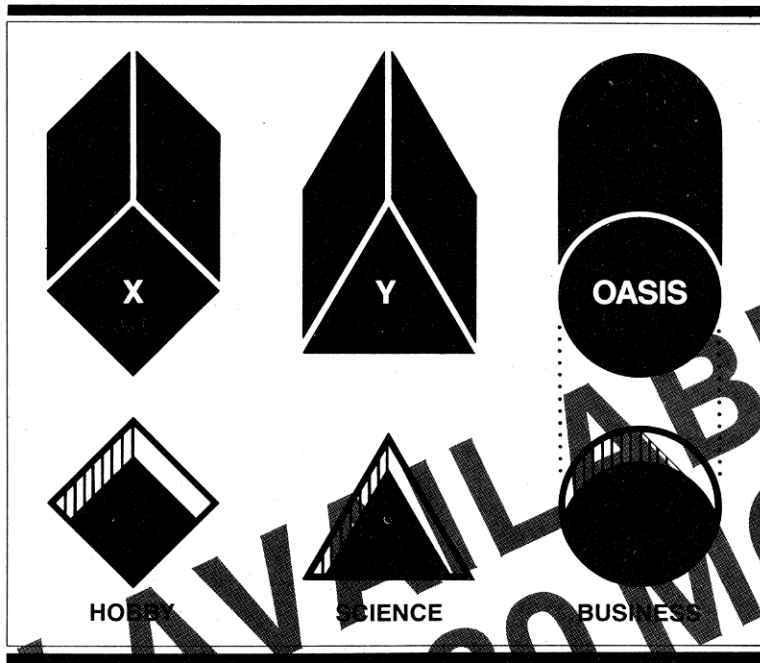

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Listing continued

```
1220 N=PEEK(X)
1230 PRINT#1,N;",";
1240 NEXTX
1250 PRINT@960,"MODE :SKETCH";STRING$(20,128);
1260 CLOSE
1270 POKE 16396,195:POKE 16397,201
1280 X=E:Y=F
1290 GOTO570
1300 PRINT@960,"MODE :LOAD";STRING$(20,128);:L=PEEK(15360)
1310 POKE15360,35
1320 A$=INKEY$
1330 A=VAL(A$)
1340 IFA<0ORA>9THEN1320
1350 IF A=0 THEN IF A$<>"0" THEN 1320
1360 POKE 16396,195:POKE 16397,77
1370 OPEN"I",2,"DRW"+A$+"IG"+"/DAT"
1380 INPUT#2,S
1390 INPUT#2,X
1400 INPUT#2,Y
1410 CLS
1420 IFEOF(2)THEN1500
1430 ZX=ZX+1
1440 INPUT#2,W
1450 IFZX=961THENGOTO1470ELSEPRINTCHR$(W);
1460 GOTO1420
1470 GOSUB1650
1480 GOSUB1600
1490 ZX=0
1500 CLOSE
1510 POKE 16396,175:POKE 16397,201
1520 GOTO570
1530 IFS=1THENIFY<24RESET(X,Y)ELSESET(X,Y):RETURN
1540 IFS=2THENIFY<24SET(X,Y)ELSERESET(X,Y):RETURN
1550 IFS=3THENIFX<64RESET(X,Y)ELSESET(X,Y):RETURN
1560 IFS=4THENIFX<64SET(X,Y)ELSERESET(X,Y):RETURN
1570 IF S=5 THEN RESET(X,Y)
1580 IF S=6 THEN SET(X,Y)
1590 RETURN
1600 IFY>=44THENY=0
1610 IFY<=-1THENY=43
1620 IFX<=-1THENX=127
1630 IFX>=128THENX=0
1640 RETURN
1650 PRINT@960,"MODE :SKETCH";STRING$(20,128);
1660 RETURN
1670 OUT236,16
1680 A=255-INP(0)
1690 IFA=0THENRETURN
1700 IFAAND16THENGOTO 260
1710 IFAAND1THENY=Y-1
1720 IFAAND2THENY=Y+1
1730 IFAAND4THENX=X-1
1740 IFAAND8THENX=X+1
1750 RETURN
1760 A=255-INP(0)
1770 IFA=16THEN1760ELSEPRINT@960,"MODE :SKETCH";STRING$(20,128);

1780 GOTO570
1790 PRINT@960,"MODE :CONVERT SKETCH SCREEN";:E=X:F=Y
1800 FOR Y=0 TO 43
1810 FOR X=0 TO 127
1820 IF POINT(X,Y) THEN RESET(X,Y) ELSE SET(X,Y)
1830 NEXT X,Y
1840 X=E:Y=F
1850 ON S GOTO 1870,1890,1910,1930,1950,1970
1860 PRINT@960,"MODE: SKETCH";STRING$(20,128);:GOTO 570
1870 S=2
1880 GOTO 1860
1890 S=1
1900 GOTO 1860
1910 S=4
1920 GOTO 1860
1930 S=3
1940 GOTO 1860
1950 S=6
1960 GOTO 1860
1970 S=5
1980 GOTO 1860
1990 E=X:F=Y
2000 PRINT@960,"MODE :PRINT    HI - RESOLUTION GRAPHICS ON OKIDA
TA 83A";
2010 FOR X=0 TO 127:FOR Y=0 TO 5:GOSUB 2740:NEXT Y:LPRINT CHR$(Z
);:Z=0:NEXT X
2020 FOR X=0 TO 127:FOR Y=6 TO 11:GOSUB 2740:NEXT Y:LPRINT CHR$(
Z);:Z=0:NEXT X
2030 FOR X=0 TO 127:FOR Y=12 TO 17:GOSUB 2740:NEXT Y:LPRINT CHR$
(Z);:Z=0:NEXT X
```

Listing continues

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42

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sketch mode. Start creating your function with the arrow keys or joystick. To convert the sketch screen, press C. To restart function drawing, press the space bar or the red button on the joystick.

To save a function hit enter, then S, then name the function (using one character). To load a function, hit enter, L, and the name you used (using one character). To exit the sketch pad, press enter and then E.

To load your function into the sketch pad, position the sketcher where you want the top left corner of your function, press break, and then the function name (using one character).

To draw your function again on the same sketch pad, repeat the instructions in the last paragraph. To exit the program hit the orange key. ■

Terry Myerson (age 10) can be reached at 233 Pine Cone Trail, Ormond Beach, FL 32074.

Introduction

Variable	Purpose
R	Number of points to light up on screen
X	How far over each point should be
Y	How far down each point should be
L	Timer loop between each lit point
S	Whether to blink "Press any key to begin"
A$	The letter entered

Main Program

Variable	Purpose
N	Input bytes entered from keyboard
A	Input bytes entered from joystick
S	Sketch pad
X	Position of sketcher across
Y	Position of sketcher down
A$	Command entry from keyboard
E	Takes place of X when X is being used for something else
F	Takes place of Y when Y is being used for something else
P	Input byte taken from function file
ZX	Counter when bytes are taken from file
Z	Bytes sent to printer
O	Number taken from data statement

Function Creator

Variable	Purpose
X	Position of sketcher across
Y	Position of sketcher down
N	Input byte entered from keyboard
A	Input byte entered from joystick
A$	Command entered from keyboard
P	Byte taken from function file

Table 1. Variables

Listing continued

```
2040 FOR X=0 TO 127:FOR Y=18 TO 23:GOSUB 2740:NEXT Y:LPRINT CHR$
(Z);:Z=0:NEXT X
2050 FOR X=0 TO 127:FOR Y=24 TO 29:GOSUB 2740:NEXT Y:LPRINT CHR$
(Z);:Z=0:NEXT X
2060 FOR X=0 TO 127:FOR Y=30 TO 35:GOSUB 2740:NEXT Y:LPRINT CHR$
(Z);:Z=0:NEXT X
2070 FOR X=0 TO 127:FOR Y=36 TO 41:GOSUB 2740:NEXT Y:LPRINT CHR$
(Z);:Z=0:NEXT X
2080 FOR X=0 TO 127:Y=42:GOSUB 2740:LPRINT CHR$(Z);:Z=0:NEXT X
2090 PRINT@960,"MODE :SKETCH";STRING$(35,128);
2100 X=E:Y=F:GOTO 570
2110 CLOSE:PRINT@960,"MODE :SKETCH";STRING$(51,128);
2120 RESUME 570
2130 POKE 16396,175:POKE 16397,201
2140 POKE 16409,1
2150 CLS
2160 ON ERROR GOTO 2710
2170 PRINT STRING$(15,179);"SUPER - DRAW :FUNCTION CREATOR";STRI
NG$(15,179);
2180 PRINT:PRINT:PRINT
2190 FOR Y=25 TO 40:SET(40,Y):SET(80,Y):NEXT Y
2200 FOR X=40 TO 80:SET(X,25):SET(X,40):NEXT X
2210 Y=33:X=60
2220 SET(X,Y)
2230 N=PEEK(14440):OUT 236,16:A=255-INP(0)
2240 IF INKEY$="C" THEN 2690
2250 IF N AND 1 OR A=16THEN 2380
2260 IF N AND 2 THEN 2610
2270 IF N AND 128 THEN 2130
2280 IF N AND 8 OR A AND 1 THEN Y=Y-1
2290 IF N AND 16 OR A AND 2 THEN Y=Y+1
2300 IF N AND 32 OR A AND 4 THEN X=X-1
2310 IF N AND 64 OR A AND 8THEN X=X+1
2320 GOSUB 2330:GOTO 2230
2330 IF Y<=26 THEN Y=38:SET(X,Y):RETURN
2340 IF Y>=39 THEN Y=27:SET(X,Y):RETURN
2350 IF X<42 THEN X=78:SET(X,Y):RETURN
2360 IF X>=79 THEN X=42:SET(X,Y):RETURN
2370 SET(X,Y):RETURN
2380 PRINT@192,"L TO LOAD,S TO SAVE,E TO EXIT TO SUPER-DRAW"
2390 A$=INKEY$:IF A$="" THEN 2390
2400 IF A$="E" OR A$="L" OR A$="S" THEN GOTO 2410 ELSE GOTO 2390

2410 IF A$="E" THEN GOTO 260
2420 IF A$="L" THEN 2520
2430 PRINT@192,"SAVE :TYPE FUNCTION FILE                    ";
2440 A$=INKEY$:IF A$="" THEN 2440
2450 POKE 16396,195:POKE 16397,77
2460 OPEN"O",1,"FUNC"+A$+"/FUC"
2470 FOR X=42 TO 78
2480 FOR Y=27 TO 38
2490 IF POINT(X,Y) THEN PRINT#1,"1";","; ELSE PRINT#1,"0";",";
2500 NEXT Y,X
2510 CLOSE:POKE 16396,175:POKE 16396,201:GOTO 2270
2520 PRINT@192,"LOAD :TYPE FUNCTION FILE                    ";

2530 A$=INKEY$:IF A$="" THEN 2530
2540 POKE 16396,195:POKE 16397,77
2550 OPEN"I",2,"FUNC"+A$+"/FUC"
2560 FOR X=42 TO 78:FOR Y=27 TO 38
2570 INPUT#2,P
2580 IF P=1 THEN SET(X,Y) ELSE RESET(X,Y)
2590 NEXT Y,X
2600 CLOSE:POKE 16396,175:POKE16396,201:GOTO 2270
2610 N=PEEK(14440):IF N=0 THEN GOTO 2610
2620 IF N AND 1 THEN FOR V=1 TO 250:NEXT V:GOTO 2230
2630 RESET(X,Y)
2640 IF N AND 8 THEN Y=Y-1
2650 IF N AND 16 THEN Y=Y+1
2660 IF N AND 32 THEN X=X-1
2670 IF N AND 64 THEN X=X+1
2680 GOSUB 2330:GOTO 2610
2690 FOR X=42 TO 78:FOR Y=27 TO 38:IF POINT(X,Y) THEN RESET(X,Y)
 ELSE SET(X,Y)
2700 NEXT Y,X:GOSUB 2330:GOTO 2230
2710 PRINT@128,"DONT BE A WISEGUY";
2720 FOR X=1 TO LEN("DONT BE A WISEGUY")
2730 FOR W=1 TO 250:NEXT W:PRINT CHR$(8);:NEXT X:GOTO 2270
2740 DATA 0,6,12,18,24,30,36
2750 FOR Q=1 TO 8:READ O:IF Y=O THEN 2770 ELSE NEXT Q
2760 GOTO 2780
2770 IF POINT(X,Y) THEN Z=Z+1:RESTORE:RETURN
2780 DATA 1,7,13,19,25,31,37
2790 FOR Q=1 TO 8:READ O:IF Y=O THEN 2810 ELSE NEXT Q
2800 GOTO 2820
2810 IF POINT(X,Y) THEN Z=Z+2:RESTORE:RETURN
2820 DATA 2,8,14,20,26,32,38
```

Listing continues

Listing continued

```
2830 FOR Q=1 TO 8:READ O:IF Y=O THEN 2850 ELSE NEXT Q
2840 GOTO 2860
2850 IF POINT(X,Y) THEN Z=Z+4:RESTORE:RETURN
2860 DATA 3,9,15,21,27,33,39
2870 FOR Q=1 TO 8:READ O:IF Y=O THEN 2890 ELSE NEXT Q
2880 GOTO 2900
2890 IF POINT(X,Y) THEN Z=Z+8:RESTORE:RETURN
2900 DATA 4,10,16,22,28,34,40
2910 FOR Q=1 TO 8:READ O:IF Y=O THEN 2930 ELSE NEXT Q
2920 GOTO 2940
2930 IF POINT(X,Y) THEN Z=Z+16:RESTORE:RETURN
2940 DATA 5,11,17,23,29,35,41
2950 FOR Q=1 TO 8:READ O:IF Y=O THEN 2970 ELSE NEXT Q
2960 GOTO 2980
2970 IF POINT(X,Y) THEN Z=Z+32:RESTORE:RETURN
2980 IF POINT(X,Y) THEN Z=Z+1:RESTORE:RETURN
2990 RETURN
3000 PRINT@960,"MODE :BLINK ";
3010 RESET(X,Y):SET(X,Y)
3020 N=PEEK(14440):IF N AND 4 THEN FOR W=1 TO 20:NEXT W
3030 GOTO 3010
```


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TRS-Turtle

by Larry Brackney
Second Place
14–18

I was fascinated by turtle graphics and turtle geometry ever since they were first introduced into the computer industry. I was first exposed to the concept of turtle geometry when I heard about a new package from Terrapin Inc. called Logo. What was this new language that so excited educators?

Turtle geometry is a new math system based on the movements of a turtle. It is oriented to the local area of the turtle, rather than from a central point. The paths the turtle takes are drawn on the monitor—hence, turtle graphics.

The student writes a program for the turtle to follow. Normally this program consists of single command statements such as:

Forward :X—This command tells the turtle to move forward X steps.
Left :X—This instructs the creature to turn left X degrees.

Students using this language are encouraged to "play turtle." That is, the student pretends he is the turtle.

Not only is Logo good for teaching computer literacy, but it also develops a more organized and logical thought process. It gives students a better chance of learning to program the computer, because Logo is much easier to program than Basic.

There was only one problem keeping me from enjoying turtle geometry and graphics. There were no Logo packages available for my computer, a Model I.

I enjoy writing Basic programs, but now I had a challenge. I had no Assembly-language background, and I wanted to write a totally new language for the TRS-80. I knew I couldn't write another Logo, but I could write a program that uses turtle geometry/graphics.

Originally TRS-Turtle was nothing more than Etch-a-Sketch with fancy commands and a function that let the computer memorize the current screen and recall it later. The first method I used was quite slow. I then rewrote the routine to read the screen much more quickly. The second thing I did was put in a Jump command, along with several other commands to erase graphics. Fi-

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Program Listing

```
10 REM-----------------------------------------------------------
     ---   T R S - T U R T L E    V E R S I O N  1 . 5    ---
     -----------------------------------------------------------

20 REM       BY LARRY J. BRACKNEY   COLUMBUS EAST HIGH SCHOOL
30 REM TITLE PAGE AND VARIABLE INITIALIZATION  LINES 40-160
40 CLS:CLEAR63
50 T$(1)="       "+CHR$(184)+STRING$(5,188)+CHR$(144)
60 T$(2)="  "+CHR$(136)+CHR$(183)+CHR$(191)+CHR$(142)+CHR$(143)+
CHR$(191)+STRING$(3,143)+CHR$(191)+CHR$(143)+CHR$(140)+CHR$(164)
+CHR$(144)
70 T$(3)=STRING$(6,140)+STRING$(2,143)+STRING$(2,140)+STRING$(2,
143)+STRING$(5,140)
80 PRINT@394,"TRS-TURTLE VERSION 1.5 BY LARRY J. BRACKNEY.";
90 PRINT@719,"COLUMBUS EAST HIGH SCHOOL 1982-83";
100 PRINT@976,"PRESS THE SPACE BAR TO BEGIN...";
110 FORT=1TO3:PRINT@469+64*T,T$(T);:NEXTT
120 X$=INKEY$:IFX$<>" "THEN120
130 CLEAR2000:DEFSTRA,B,D,S:DEFINTC,E-R,T-Z
140 DIML$(200),LN(200),LX(200),LY(200),SC(7),CM$(20):FORT=1TO20:
READCM$(T):NEXTT
150 CLS:W=1:T$="HELP":CL$=STRING$(10,128):A="":B="":X=64:Y=24:GO
TO1360
160 CLS:A="":B="":X=64:Y=24
170 REM MAIN INPUT ROUTINE LINES 180-380
180 POKEVARPTR(A),0:PRINT@960,B+CHR$(143)+" ";:A=INKEY$:IFA=""TH
ENRESET(X,Y):SET(X,Y):GOTO180
190 FORT=9TO10:IFA=CHR$(T)THEN210ELSENEXTT
200 IFA<>CHR$(31)THEN220
210 A="":B="":PRINT@960,STRING$(10,128);
220 IFA=CHR$(13)THENGOTO250:ELSEIFA=CHR$(8)THEN380
230 IFA="["THENB=T$:GOTO250
240 B=B+A:IFLEN(B)>10THEN1930ELSE180
250 L$(W)=B:W=
+1:T$=B
260 FORT=16TO20:IFB=CM$(T)THENW=W-1:NEXTTELSENEXTT
270 IFB=CM$(1)THENW=W-1
280 IFB=CM$(10)THENW=W-1
290 IFB=CM$(11)THENW=W-1
300 FORCN=1TO20:IFB=CM$(CN)THEN320ELSENEXTCN
310 W=W-1:GOTO1920
320 ONCNGOTO160,400,510,620,730,840,970,1100,1230,1360,1440,1490
,330,350,370,1950,1660,1810,130,1830
330 HT=1:B$="":PRINT@960,CL$;
340 IFRL=1THEN1890ELSE180
```

Listing continues

Listing continued

```
350 HT=0:B$="":PRINT@960,CL$;
360 IFRL=1THEN1890ELSE180
370 CLS:PRINT"THE TURTLE SAYS BYE...":END
380 IFLEN(B)>0THENB=LEFT$(B,LEN(B)-1):GOTO180ELSE180
390 REM MOVE TURTLE RIGHT ROUTINE 400-490
400 C$=B
410 IFRL=1THEN440
420 PRINT@960,C$" ?";
430 A=INKEY$:IFA=""THEN430
440 IFRL=1THENA=STR$(LN(NU))ELSELN(W-1)=VAL(A)
450 FORZ=XTOX+VAL(A):IFZ>127THENX=127:GOTO480
460 IFHT=1THENRESET(Z,Y)ELSESET(Z,Y)
470 NEXTZ:X=X+VAL(A)
480 PRINT@960,CL$;:B=""
490 IFRL=1THEN1890ELSE180
500 REM MOVE TURTLE LEFT ROUTINE 510-600
510 C$=B
520 IFRL=1THEN550
530 PRINT@960,C$" ?";
540 A=INKEY$:IFA=""THEN540
550 IFRL=1THENA=STR$(LN(NU))ELSELN(W-1)=VAL(A)
560 FORZ=XTOX-VAL(A)STEP-1:IFZ<0THENX=0:GOTO590
570 IFHT=1THENRESET(Z,Y)ELSESET(Z,Y)
580 NEXTZ:X=X-VAL(A)
590 PRINT@960,CL$;:B=""
600 IFRL=1THEN1890ELSE180
610 REM MOVE TURTLE UP ROUTINE 620-710
620 C$=B
630 IFRL=1THEN660
640 PRINT@960,C$" ?";
650 A=INKEY$:IFA=""THEN650
660 IFRL=1THENA=STR$(LN(NU))ELSELN(W-1)=VAL(A)
670 FORZ=YTOY-VAL(A)STEP-1:IFZ<0THENY=0:GOTO700
680 IFHT=1THENRESET(X,Z)ELSESET(X,Z)
690 NEXTZ:Y=Y-VAL(A)
700 PRINT@960,CL$;:B=""
710 IFRL=1THEN1890ELSE180
720 REM MOVE TURTLE DOWN ROUTINE 730-820
730 C$=B
740 IFRL=1THEN770
750 PRINT@960,C$" ?";
760 A=INKEY$:IFA=""THEN760
770 IFRL=1THENA=STR$(LN(NU))ELSELN(W-1)=VAL(A)
780 FORZ=YTOY+VAL(A):IFZ>44THENY=44:GOTO810
790 IFHT=1THENRESET(X,Z)ELSESET(X,Z)
800 NEXTZ:Y=Y+VAL(A)
810 PRINT@960,CL$;:B=""
820 IFRL=1THEN1890ELSE180
830 REM MOVE TURTLE UP AND RIGHT ROUTINE 840-950
840 C$=B
850 IFRL=1THEN880
860 PRINT@960,C$" ?";
870 A=INKEY$:IFA=""THEN870
880 IFRL=1THENA=STR$(LN(NU))ELSELN(W-1)=VAL(A)
890 FORZ=1TOVAL(A):X=X+1:Y=Y-1
900 IFX>127THENX=127:Y=Y+1:GOTO940
910 IFY<0THENY=0:X=X-1:GOTO940
920 IFHT=1THENRESET(X,Y):RESET(X-1,Y+1)ELSESET(X,Y)
930 NEXTZ
940 PRINT@960,CL$;:B=""
950 IFRL=1THEN1890ELSE180
960 REM MOVE TURTLE UP AND LEFT ROUTINE 970-1080
970 C$=B
980 IFRL=1THEN1010
990 PRINT@960,C$" ?";
1000 A=INKEY$:IFA=""THEN1000
1010 IFRL=1THENA=STR$(LN(NU))ELSELN(W-1)=VAL(A)
1020 FORZ=1TOVAL(A):X=X-1:Y=Y-1
1030 IFX<0THENX=0:Y=Y+1:GOTO1070
1040 IFY<0THENY=0:X=X+1:GOTO1070
1050 IFHT=1THENRESET(X,Y):RESET(X+1,Y+1)ELSESET(X,Y)
1060 NEXTZ
1070 PRINT@960,CL$;:B=""
1080 IFRL=1THEN1890ELSE180
1090 REM MOVE TURTLE DOWN AND RIGHT ROUTINE 1100-1210
1100 C$=B
1110 IFRL=1THEN1140
1120 PRINT@960,C$" ?";
1130 A=INKEY$:IFA=""THEN1130
1140 IFRL=1THENA=STR$(LN(NU))ELSELN(W-1)=VAL(A)
1150 FORZ=1TOVAL(A):X=X+1:Y=Y+1
1160 IFX>127THENX=127:Y=Y-1:GOTO1200
1170 IFY>44THENY=44:X=X-1:GOTO1200
1180 IFHT=1THENRESET(X,Y):RESET(X-1,Y-1)ELSESET(X,Y)
1190 NEXTZ
1200 PRINT@960,CL$;:B=""
1210 IFRL=1THEN1890ELSE180
1220 REM MOVE TURTLE DOWN AND LEFT ROUTINE 1230-1340
```

Listing continues

nally, I added program-writing capabilities such as List, Run, and FIX.

TRS-Turtle starts out with a short title page that prompts the user to press the space bar to begin. Then a small blinking square (the turtle) appears at midscreen, and a block cursor appears at the lower left of the screen.

After typing in the appropriate command, press the enter key as in normal Basic. Do not type in line numbers.

When entering a direction command (for example, Left), the computer will prompt you with a question mark. The computer is asking you for a number from one to nine. This number represents the number of steps in that direction the turtle can take. The direction commands are the only commands that have this format. Two other commands (Jump and List) require optional input after they are entered; these will be explained later.

In addition to the ability to type in commands, two other keys have functions. The clear key erases the entire line. The up arrow will repeat the last command. Thus, instead of typing in 20 Left commands, just one and the up arrow can be used to generate 20 repeated commands.

"Originally TRS-Turtle was nothing more than Etch-a-Sketch with fancy commands. . ."

Now for a brief summary of the commands.

- Right—Moves the turtle right (X) steps. Turtle will leave a trail unless Hide is used.
- Left—Moves the turtle left (X) steps. Turtle will leave a trail unless Hide is used.
- Up—Moves the turtle up (X) steps. Turtle will leave a trail unless Hide is used.
- Down—Moves the turtle down (X) steps. Turtle will leave a trail unless Hide is used.
- <Up—Moves the turtle left and up(X) steps. Turtle will leave a trail unless Hide is used.
- Up>—Moves the turtle right and up (X) steps. Turtle will leave a trail unless Hide is used.

Listing continued

```
1230 C$=B
1240 IFRL=1THEN1270
1250 PRINT@960,C$" ?";
1260 A=INKEY$:IFA=""THEN1260
1270 IFRL=1THENA=STR$(LN(NU))ELSELN(W-1)=VAL(A)
1280 FORZ=1TOVAL(A):X=X-1:Y=Y+1
1290 IFX<0THENX=0:Y=Y-1:GOTO1330
1300 IFY>44THENY=44:X=X+1:GOTO1330
1310 IFHT=1THENRESET(X,Y):RESET(X+1,Y-1)ELSESET(X,Y)
1320 NEXTZ
1330 PRINT@960,CL$;:B=""
1340 IFRL=1THEN1890ELSE180
1350 REM LEARN THE SCREEN ROUTINE 1360-1420
1360 PRINT@960,CL$;:D="":RESET(X,Y):X1=X:Y1=Y
1370 POKEVARPTR(D),128
1380 FORC=0TO7
1390 POKEVARPTR(D)+1,(15360+C*128)AND255
1400 POKEVARPTR(D)+2,(15360+C*128)/256
1410 SC(C)=D:NEXTC
1420 B="":IFHE=0THEN180ELSE1960
1430 REM REMEMBER THE SCREEN ROUTINE 1440-1470
1440 CLS:X=X1:Y=Y1:FORC=0TO6:PRINTSC(C);:NEXTC
1450 PRINTLEFT$(SC(7),127);CHR$(28);
1460 POKE16383,ASC(RIGHT$(SC(7),1))
1470 B="":GOTO180
1480 REM JUMP ROUTINE 1490-1640
1490 IFRL=1THEN1640
1500 LX=X:LY=Y
1510 IFW=2ORNU=1THENRESET(X,Y)
1520 PP=PEEK(14400)
1530 IFPP=8THENLY=LY-1
1540 IFPP=16THENLY=LY+1
1550 IFPP=32THENLX=LX-1
1560 IFPP=64THENLX=LX+1
1570 IFPP=128THEN1630
1580 PRINT@960,"X="LX,"Y="LY"   PRESS THE SPACE BAR TO STOP.";
1590 IFLX<0THENLX=0ELSEIFLX>127THENLX=127
1600 IFLY<0THENLY=0ELSEIFLY>44THENLY=44
1610 IFPOINT(LX,LY)THENRESET(LX,LY):SET(LX,LY):GOTO1520
1620 SET(LX,LY):RESET(LX,LY):GOTO1520
1630 A=INKEY$:B="":X=LX:Y=LY:LX(W-1)=LX:LY(W-1)=LY:PRINT@960,STR
ING$(62,128);:GOTO180
1640 X=LX(NU):Y=LY(NU):GOTO1890
1650 REM LIST ROUTINE 1660-1790
1660 CLS
1670 IFL$(1)="LIST"ANDW=1THENB="":W=1:GOTO180
1680 INPUT"ON PRINTER (Y/N)";D$
1690 IFD$="Y"THEN1740
1700 IFD$<>"N"THEN1660
1710 CLS:FORT=1TOW-1:PRINTT":",L$(T),LN(T):FORV=1TO25:NEXTV:IFL$
(T)="JUMP"THENPRINT,"X="LX(T),"Y="LY(T)
1720 IFPEEK(14464)=1THEN1720ELSENEXTT
1730 GOTO1760
1740 CLS:FORT=1TOW-1:LPRINTT":",L$(T),LN(T):IFL$(T)="JUMP"THENLP
RINT,"X="LX(T),"Y="LY(T)
1750 PRINTT":",L$(T),LN(T):IFL$(T)="JUMP"THENPRINT,"X="LX(T),"Y=
"LY(T):NEXTTELSENEXTT
1760 PRINT"PRESS ANY KEY..."
1770 X$=INKEY$:IFX$=""THEN1770
1780 B="":CLS
1790 GOTO160
1800 REM FIX ROUTINE 1810
1810 W=W-1:B="":PRINT@960,CL$;:GOTO180
1820 REM RUN ROUTINE 1830-1900
1830 CLS:X=64:Y=24:RL=1:NU=1
1840 IFNU=W+1THEN1900
1850 FORCN=1TO20
1860 IFL$(NU)=CM$(CN)THENPC=CN
1870 NEXTCN
1880 ONPCGOTO160,400,510,620,730,840,970,1100,1230,1360,1440,149
0,330,350,370,1950,1660,1810,10
1890 NU=NU+1:GOTO1840
1900 B="":RL=0:GOTO180
1910 REM ERROR MESAGES 1920 AND 1930
1920 PRINT@960,"SORRY! THE TURTLE DOESN'T KNOW THAT WORD!";:FORT
=1TO500:NEXTT:PRINT@960,STRING$(41,128);:B="":GOTO180
1930 PRINT@960,STRING$(51,128);:PRINT@960,"YOU TYPED TO MUCH FOR
 THE TURTLE!";:FORT=1TO500:NEXTT:PRINT@960,STRING$(50,128);:B=""
:GOTO180
1940 REM HELP ROUTINE 1950-1990
1950 HE=1:GOTO1360
1960 CLS:PRINT"THE TURTLE KNOWS HOW TO..."
1970 FORT=1TO20STEP2:PRINTCM$(T),CM$(T+1):NEXTT
1980 PRINT" ":PRINT"PRESS THE SPACE BAR TO CONTINUE..."
1990 X$=INKEY$:IFX$<>" "THEN1990ELSEHE=0:GOTO1440
2000 REM COMMANDS STORED IN DATA IN LINE 2010
2010 DATA CLEAR,RIGHT,LEFT,UP,DOWN,UP>,<UP,DOWN>,<DOWN,LEARN,REM
EMBER,JUMP,HIDE,FIND,BASIC,HELP,LIST,FIX,FORGET,RUN
```

- <Down—Moves the turtle left and down (X) steps. Turtle will leave a trail unless Hide is used.
- Down>—Moves the turtle right and down (X) steps. Turtle will leave a trail unless Hide is used.
- Clear—Clears the screen. Clear does not effect learned screens or listings in memory.
- Learn—Learns the current screen, and puts it in memory. The learned screen is called back by Remember.
- Remember—Recalls learned screens, and puts them on the screen.
- Jump—Gives the user control of a blinking turtle. Move him around with the arrow keys and press the space bar to stop the turtle. The current X and Y coordinates are given at the bottom of the screen.
- Find—Finds the turtle. The turtle draws instead of erasing as in the Hide command.
- Hide—Hides the turtle. The turtle erases instead of drawing as in the Find command.
- Basic—Returns the program to Basic.
- Help—Gives a directory of all available commands.
- List—Lists the program in memory. Lines can be listed on the screen or on a printer.
- Fix—This deletes the last line typed from the listing, allowing the user to replace the line. Note: The user can only Fix the last line typed.
- Run—Runs the program in memory. The turtle goes through all of the steps drawing the picture the user wrote.
- Forget—Deletes all lines of the user's program and learned screens.

These commands are straightforward with a few exceptions. When typing Jump, a blinking turtle appears. The user moves the turtle by using the arrow keys. When the desired location for the turtle is found press the space bar.

Now for some notes on a sample listing. Listings may be given on either the printer or on the screen. To make a screen listing pause, hold down the shift key. A sample listing might look like this:

```
1:  UP      9
2:  LEFT    9
3:  RIGHT   7
4:  RIGHT   7
5:  DOWN    3
6:  UP      2
7:  JUMP    0
            X=100  Y=33
```

The numbers to the far left are the line numbers of the user's program.

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These line numbers shouldn't exceed 200 unless you wish to modify TRS-Turtle.

The word after the colon is the actual statement. Commands other than directions, Hide, Find, and Jump will not be listed. The numbers to the far right are the command values. This simply means that as a direction is typed, the number of steps the turtle takes is displayed here. Commands other than directions will have a 0 in this place.

The numbers after the Jump command, X=XXX Y=YYY, are the positions to which the turtle jumped. These numbers are only displayed if a Jump command is encountered.

The Fix command will delete the last line of the program. TRS-Turtle draws the picture as you type it in, thus making it easy to spot your mistakes. After spotting an error, type Fix. This gets rid of the last command. Now type in a new command. After the correction run the program and it will draw the corrected picture. You can then continue typing more commands.

The Program

Lines 10–160 handle the title page and variable initialization. Lines 160 and 170 seem to repeat each other, but do not change them or you will run into problems. Many other situations may arise where it appears I have merely repeated myself. Don't be fooled—everything is necessary.

Lines 180–380 control the user input. Line 180 is the main line; it reads the input and assigns it to A$. A$ is then added to B$ after enter is pushed. The computer compares B$ to CM$(X). If B$ is equal to CM$(X), then it goes to the appropriate routine. This routine also checks for backspacing and nonexistent commands. If a command the computer doesn't know is typed in, the computer branches to the proper error message.

Lines 390–1340 move the turtle in the appropriate direction. Lines 400–490 make the turtle draw to the right. The first few lines control user input and convert the input to a digit. Next a For...Next loop draws the line in the correct direction that number of steps.

Lines 1360–1420 memorize the screen. The screen is stored into seven variables SC(1–7). These variables are called back by the Remember routine.

The Remember routine lies between lines 1440 and 1470. All this does is recall the variables stored in the Learn routine.

The Jump command is controlled from lines 1490–1640. This routine PEEKs keyboard address 14400 for the arrows and the space bar. The numbers received are acted upon in the appropriate fashion.

The List routine (lines 1660–1790) goes through a loop, calling up the array of variables and printing them on either the printer or the screen.

Line 1810 sets the command counter back one to erase the last command. It then jumps back to the input routine.

The Run routine is in lines 1830–1900. This routine goes through the command list that the user typed in and executes each command.

The variable RL is the flag that keeps individual routines from sending control back to the input routine. Instead control is returned to line 1890, which goes to the next command to be executed.

Lines 1920 and 1930 are the error messages. No language should be without them, and mine is no different. I have only included two messages, but these should be sufficient for most mistakes.

The Help routine is located in lines 1950–1990. This routine sets a variable flag, HE, and memorizes the screen. The flag sends control back to Help instead of line 180. The computer then gives the user a list of available commands, and then restores the previous screen.

Finally, line 2010 is the data statement in which all 20 TRS-Turtle commands are stored. If you don't like the word chosen for the commands, this is the line to change.

Notes for Tinkerers

Here are a few suggestions for possible modifications. A routine could save the user's program to disk or cassette. A program change could make the left and right commands more realistic (that is, LEFT :X where X is the number of degrees the turtle would turn). Of course this change would require that the turtle's forward movement routines be changed to move at that angle. How about new commands in general? They wouldn't necessarily need to deal with turtle geometry (they could be text commands).

Happy turtling. ■

Larry Brackney (age 15) can be reached at 2525 16th St., Columbus, IN 47201.

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To help give you an idea how fast compiled programs are, we have included this demo program:

ZBASIC 2.2 DEMO PROGRAM

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ZBASIC Program size (WITHOUT VARIABLES)	**: 2733 BYTES**

(Remember that the ZBASIC program includes an 1879 byte subroutine package.) Program shown exactly as compiled and run in BASIC and ZBASIC.

```
10 '========= ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST=======
20 CLS:CLEAR100:DEFINT A-X:DEFSTR Z:DIM AA(64,24),Z(50):RANDOM
30 AA=100:BB=-1000:CC=3:DD=-3:EE=-9999:ST$="START TIME "+TIME$
40 FOR I=1TO127STEP2 :FOR J=47TO1STEP-3:XX=POINT(I,J):SET(I,J)
50 XX=(I-J)/CC*(7+I+J) :XX=ABS(INT(RND(I*J)-AA)+7) :RESET(I,J)
60 XX=PEEK(I+J) :POKE15360+I+J,J :OUT255,J AND (3*J):XX=INP(I)
70 AB$=STR$(I+J) :BA$=LEFT$(AB$,2) :AA(I/2,J/2)=VAL(BA$)+AA*3
80 BA$=BA$+RIGHT$(BA$,RND(3)) :XX=INSTR(1,BA$,"9"):XX=SQR(I*J)
90 BA$=MID$(BA$,2,2) :MID$(BA$,1,1)=Z :IF XX THEN 100 ELSE CLS
100 IF LEN(BA$))3 OR SGN(XX)=1 AND ASC(BA$)=32 THEN PRINT"+++";
110 IFPOS(0))62 THEN TRON:TROFF:PRINT ELSE XX=NOT(RND(99))+100
120 A$=INKEY$:IF A$="Y" OR A$="y" AND I)120 THEN PRINT"TRUE.."
130 RESTORE :READA,C,Z(J),D:GOSUB170:GOSUB170:GOSUB170:GOTO210
140 NEXT :PRINT"*";:NEXTI:CLS:PRINT@512,ST$,"STOP TIME ";TIME$
150 STOP'============== END OF MAIN TEST LOOP ================
160 DATA 12345,-1,"TEST",-9999
170 ON RND(6) GOTO 180,190,200,180,190,200
180 RETURN
190 RETURN
200 RETURN
210 ON RND(9) GOSUB 180,190,200,180,190,200,180,190,200
220 GOTO140
```

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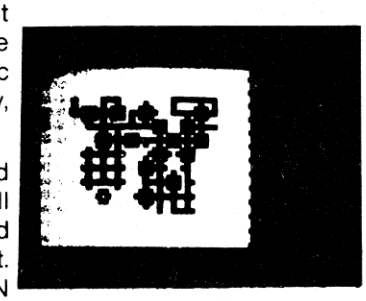

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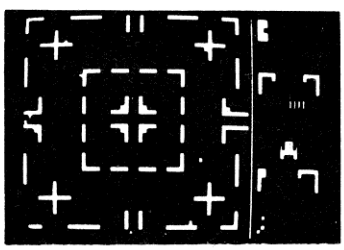
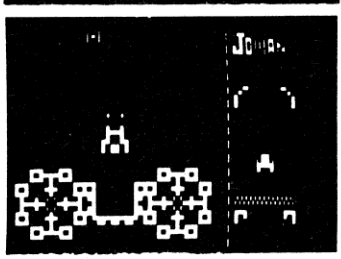
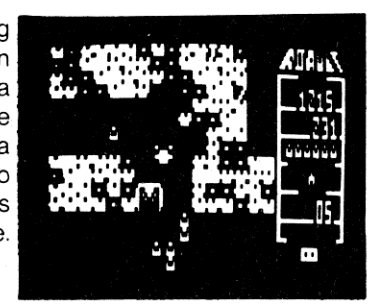
Computer Shack strives to be the best, to come out with new games, new ideas, and new techniques. We want to be the pacesetters of the industry. We were first with an all graphics Dungeons and Dragons game. Called DUNGEON ESCAPE, it combined spontaneous action and spectacular sound routines with an almost impossible quest. DUNGEON ESCAPE became an immediate success. Written by Bill Dunlevy, DUNGEON ESCAPE is still going strong after two years.





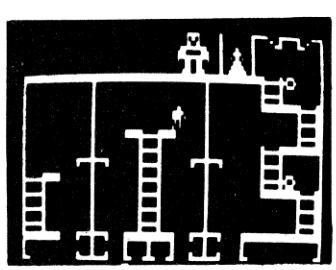
Then in 1982, we peaked with two legendary games that put Computer Shack on the top of the arcade market: CYBORG and JOVIAN. Both written with the combined talents of Bill Dunlevy and Doug Frayer, they became overwelming successes. CYBORG, a totally original game, uses nine screens at a time with 20 different levels of play. A brilliant contest of skill as well as intelligence, it has been called a "TRS-80 classic" by Bob Lidell in 80 US. JOVIAN, brings to your screen, effects like you've never seen before. you take a trip to JOVIAN space where you manuever your space sled around mines and fast moving aliens in order to achieve your final goal, the destruction of all JOVIAN life. Both CYBORG and JOVIAN have received rave reviews on a national level, not only because of creativity behind each of them, but because they have used many new programming techniques. One of the most original techniques is a new type of wrap around screen that will amaze and dazzle you.

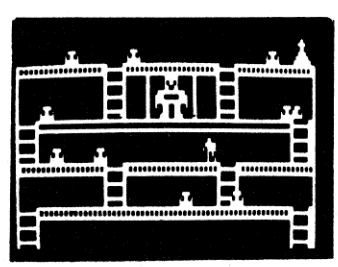
Now, in 1983, Computer Shack reaches new heights with two great new games, sure to storm the market and set the standard for all games that follow.

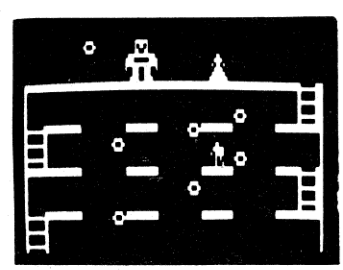


First we bring you ASSAULT, another great game by Doug Frayer and Bill Dunlevy. Along with their usual array of spectacular graphics and sound, they've given their new creation something rarely found in computer games these days, originality. ASSAULT isn't just a copy of another game. Using total imagination, the programmers have managed to create what promises to be another "Classic". Using a creative concept, the game places you in a mountain haven, surrounded by sparkling gold. Your goal: destroy the monsters trying to steal the gold and zap all the poisonious mushrooms. Fantastic graphics and sound, this program uses Dunlevy and Frayers "wrap around graphics"˜ it uses 9 screens at a time. With many different levels.

Next we give to you LIBERATOR, an arcade action game written by John Crane. LIBERATOR is great for all arcade buffs and adventurers, alike. While working on perfecting an automated robot,your creation goes berserk, capturing your five lovely assistants and running off to different locations in the industrial park. Now you must search out your assistants. Being careful of Beer Barrels, Little Robots, Waterfalls, Elevators, flying boulders etc. If you're hit, its all over. LIBERATOR is sure to become popular, with its 5 totally different screens.







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The Lair of Kraken

by Beth Norman
Second Place
11–13

Program Listing

```
100 CLS:PRINT"      THE LAIR OF THE KRAKEN"
105 FOR T=1 TO 500:NEXT T
110 PRINT
115 PRINT"    AN UNDERWATER ADVENTURE"
120 FOR T=1 TO 500:NEXT T
125 PRINT
130 PRINT"        BY BETH ANN NORMAN"
135 PRINT"         FRAMINGHAM, MASS."
140 FOR T=1 TO 1000:NEXT T
145 PRINT:PRINT
150 INPUT"WOULD YOU LIKE INSTRUCTIONS";A$
155 IF LEFT$(A$,1)="N"THEN 195 ELSE IF LEFT$(A$,1)<>"Y" THEN 150
160 CLS: PRINT"  YOU WILL TRAVEL THROUGH AN    UNDERWATER PALACE
, BATTLING  SEACREATURES AS YOU GO.  YOU MUST  FIND THE SWORD OF
 THE MERMAN    ANDON.  YOU NEED IT TO KILL THE KRAKEN--A GIANT S
QUID-LIKE MON- STER FREQUENTLY MISTAKEN FOR A  SMALL ISLAND!
165 PRINT"  THEN YOU WILL BE FREE."
170 PRINT"  YOUR COMMANDS ARE N, E, W, ANDS, THE DIRECTIONS; M,
FOR MAP;  AND C, TO SEE YOUR INVENTORY,   STRENGTH, ETC."
175 PRINT"  GOOD LUCK!"
180 PRINT"PRESS ANY KEY TO CONTINUE."
185 I$=INKEY$
190 IF I$=""THEN 185
195 CLS:INPUT"YOUR NAME";B$
200 C=RND(-TIMER)
205 C=RND(6)
210 IF C=1 THEN D$="ELF"
215 IF C=2 THEN D$="DWARF"
220 IF C=3 THEN D$="FIGHTER"
225 IF C=4 THEN D$="HALFLING"
230 IF C=5 THEN D$="CLERIC"
235 IF C=6 THEN D$="GNOME"
240 E=RND(-TIMER):GOSUB 250
245 GOTO 265
250 E=RND(18)
255 IF E<5 THEN 250
260 RETURN
265 F=E:GOSUB 250
270 G=E:GOSUB 250
275 H=E:GOSUB 250
280 I=E:GOSUB 250
285 J=E:GOSUB 250
290 K=RND(-TIMER)
295 K=RND(6):IF K<4 THEN L$="PLATE MAIL ARMOR" ELSE L$="CHAIN MA
IL ARMOR"
300 M=RND(-TIMER)
305 M=RND(6):IF M<4 THEN N$="SWORD" ELSE N$="HAND-AXE"
310 GOSUB 335
315 PRINT:PRINT"PRESS ANY KEY TO CONTINUE."
320 I$=INKEY$
325 IF I$="" THEN 320
330 GOTO 380
335 PRINT:PRINT"YOUR GAME CHARACTER SHALL BE    "B$" THE "D$:PRI
NT"STRENGTH:"F
340 PRINT"INTELLIGENCE:"G:PRINT"WISDOM:"H
345 PRINT"DEXTERITY:"I:PRINT"CONSTITUTION:"J
```

Listing continues

I wrote this game, The Lair of the Kraken, for a 32K Extended Color Basic Color Computer. It is a computerized, underwater Dungeons-and-Dragons game.

The object is to travel through an underwater palace, battling monsters and finding objects. You need one of these objects to kill the Kraken (a type of monster) and set yourself free. The game creates a random character for you.

Monsters with different strengths are randomly placed in the dungeon's rooms. When entering a room containing a monster, you can fight or run. If you run, you may be caught! Your chance to hit a monster is raised or lowered according to your character's ability scores (strength or intelligence). Since Lair of the Kraken is not too difficult to win, it is aimed at kids. If you wish to make the fighting odds tougher or easier, then add:

```
575 IF S<5 THEN W=10 ELSE W=13
```

Change the W = 10 and W = 13 to two other numbers from 1 to 20 (the second W should be higher than the first). The lower you make these numbers, the easier it is to hit monsters. If you want to make the fight with the Kraken harder, add ELSE W = W + 4 to the end of line 585, which reads:

```
585 IF PP<>0 THEN W=W-6
```

The Key Box

Color Computer
32K RAM
Extended Color Basic

Listing continued

```
350 PRINT"CHARISMA:"E:PRINT"WEARING "L$" AND":PRINT"CARRYING A "
N$"."
355 IF JJ$=""THEN RETURN ELSE PRINT"ALSO CARRYING:"JJ$
360 PRINT"PRESS ANY KEY TO CONTINUE"
365 I$=INKEY$
370 IF I$=""THEN365
375 RETURN
380 GOTO 510
385 PMODE 4,1:PCLS:SCREEN 1,1
390 LINE (20,92)-(28,104),PSET,B
395 LINE(28,92)-(32,104),PSET,B
400 LINE(32,93)-(36,103),PSET,B
405 LINE(36,94)-(40,102),PSET,B
410 LINE(40,95)-(44,101),PSET,B
415 LINE(44,96)-(48,100),PSET,BF
420 LINE(48,80)-(52,116),PSET,BF
425 LINE(36,64)-(64,80),PSET,B
430 LINE(36,116)-(64,132),PSET,B
435 LINE(48,132)-(52,136),PSET,BF
440 LINE(48,136)-(68,140),PSET,BF
445 LINE(64,108)-(68,140),PSET,BF
450 LINE(60,108)-(68,88),PSET,B
455 LINE(68,96)-(120,100),PSET,BF
460 LINE(64,68)-(80,72),PSET,BF
465 LINE(80,68)-(100,84),PSET,B
470 LINE(88,84)-(92,96),PSET,BF
475 LINE(120,88)-(132,108),PSET,B
480 LINE(132,96)-(156,100),PSET,BF
485 LINE(156,76)-(192,116),PSET,B
490 I$=INKEY$
495 IF I$="" THEN 490
500 SCREEN 0,0
505 RETURN
510 GOTO 555
515 P=RND(-TIMER)
520 P=RND(6)
525 IF P=Q THEN 520
530 FOR R=1 TO P
535 READ R$,S,T
540 NEXT R
545 RESTORE
550 Q=P:RETURN
555 GOTO 655
560 IF L$="PLATE MAIL ARMOR"THEN U=0 ELSE U=1
565 IF T<6 THEN V=15 ELSE V=12
570 IF U=1 THEN V=V-1
575 IF S<5 THEN W=10 ELSE W=13
580 IF (F+G+I)>27 THEN W=W-4
585 IF PP<>0 THEN W=W-6
590 CLS:PRINT"YOU ARE FIGHTING A "R$"
595 PLAY "L1603AL404CL1603AL404C"
```

Listing continues

My program makes good use of the RND(-TIMER) command. This line, placed right before a RND command, resets the random-number subroutine and guarantees that the numbers really will be different each time you play.

There is a high-resolution map, drawable at any time except during a fight. You can review your character and what he or she is carrying at any time, also.

I think this game is a good introduction to adventure games, as the maze is not very complicated. Since you always have a chance to run away from a fight, there are no unsuspected deaths to trap the unwary. ■

Beth Norman, age 12, can be reached at 8 Doris Road, Framingham, MA 01701.

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Listing continued

```
600 PRINT"USE THE SPACE BAR":PRINT"TO STRIKE, "B$"!"
605 I$=INKEY$
610 IF I$<>" " THEN 605
615 X=RND(-TIMER)
620 X=RND(20)
625 PRINT:PRINT"YOU STRIKE!":IF X<W THEN 640
630 PRINT"YOU HIT!THE "R$" IS"
635 PRINT"DEAD!":RETURN
640 PRINT"YOU MISS!":X=RND(20)
645 PRINT:PRINT"YOUR FOE STRIKES!":IF X>V THEN 1525
650 PRINT"IT MISSES!":GOTO 600
655 GOTO 660
660 GOTO 695
665 INPUT"YOUR COMMAND";A$
670 IF A$="N" OR A$="E" OR A$="W" OR A$="S"THEN RETURN
675 IF A$="M"THEN GOSUB 385 ELSEIF A$="C"THEN GOSUB 335 ELSE 685
680 GOTO 665
685 PRINT"PLEASE USE N,E,W,S,M,OR C."
690 GOTO 665
695 CLS
700 PRINT"  YOU ARE A POOR "D$","
705 PRINT"BARELY EKING OUT A LIVING AS A  FISHERMAN."
710 PRINT"  ONE DAY, YOU ARE OUT ROWING   WHEN YOU HEAR A SWEET
SOUND     COMING FROM BEHIND A ROCK.  YOU"
715 PRINT"INVESTIGATE AND FIND THAT IT IS THE SINGING OF A GROUP
 OF MER-  MAIDS."
720 PRINT"THEY SURROUND YOUR BOAT AND MAKESTRANGE PASSES IN THE
AIR WITH  THEIR HANDS.  ONE INFORMS YOU   THAT THEY HAVE CAST A
WATER-    BREATHING SPELL ON YOU."
725 PRINT"   PRESS ANY KEY TO CONTINUE."
730 I$=INKEY$
735 IF I$="" THEN 730
740 CLS:PRINT"  THEY DRAG YOU UNDER THE SUR-  FACE AND YOU FIND
THAT YOU CAN  BREATHE, TALK, AND MOVE FREE-   LY UNDERWATER."
745 PRINT"THEY TAKE YOU FAR,FAR DOWN TO   THE TOP OF A STAIRCASE
 LEADING  DOWN TO VARIOUS PASSAGEWAYS AND ROOMS."
```

Listing continues

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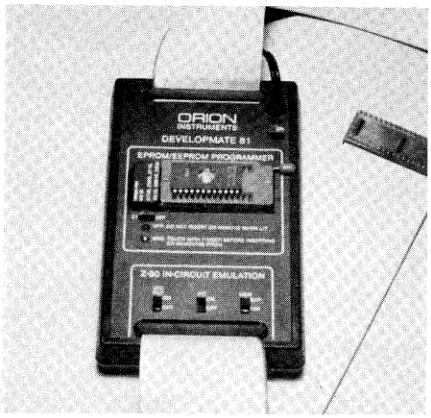

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Listing continued

```
750 PRINT"   PRESS <M> TO SEE THE MAP NOW;WHEN YOU HAVE STUDIED
IT, PRESS ANY KEY TO CONTINUE THE GAME."
755 I$=INKEY$
760 IF I$<>"M" THEN 755
765 GOSUB 385
770 CLS:PRINT"  ONE MERMAID TELLS YOU THAT YOUMUST FIND THE SWOR
D OF ANDON,   THEIR MASTER, AND USE IT TO KILLTHE KRAKEN."
775 PRINT"YOU WILL THEN SET YOURSELF FREE."
780 PRINT"  LAUGHING,THEY SWIM AWAY."
785 PRINT"CURIOUS,YOU DESCEND THE STAIRS."
790 PRINT"YOU FIND YOURSELF IN AN INTER-  SECTION GOING NORTH, S
OUTH, AND WEST."
795 GOSUB 665
800 IF A$="W"THEN860
805 IF A$="S"THEN865
810 IF A$="N"THEN825
815 PRINT"CAN'T GO THAT WAY!":GOSUB665
820 GOTO 800
825 PRINT"YOU GO 40 FT.NORTH AND COME TO A ROOM."
830 IF L2=0 THEN 840 ELSE PRINT"IT'S EMPTY."
835 GOTO 880
840 GG$="LAMP":HH$="DAGGER":GOSUB 515
845 GOSUB 1420
850 IF LL>6 THEN 880 ELSE 870
855 LL=0
860 PRINT"YOU'RE ON THE TOP OF THE STAIRS.SUDDENLY,THEY CRUMBLE.
":GOTO 790
865 PRINT"YOU GO 40 FT. SOUTH AND COME TO A ROOM.":IF NN=0 THEN
1120 ELSEPRINT"IT'S EMPTY.":GOTO 1150
870 GG$="LAMP":HH$="DAGGER"
875 GOSUB 1485
880 PRINT"THERE ARE EXITS EAST AND SOUTH.":L2=L2+1
885 GOSUB 665
890 IF A$="E"THEN 910 ELSE IF A$="S"THEN 905 ELSE PRINT"CAN'T GO
 THAT WAY."
895 GOSUB 665
```

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Listing continued

```
900 GOTO 890
905 PRINT"YOU GO 40 FT. SOUTH.":GOTO 790
910 PRINT"YOU GO 40 FT. EAST AND COME TO  A ROOM."
915 PRINT"GEE,IT'S DARK IN HERE.  TOO DARKTO SEE,AS A MATTER OF
FACT.":EE$="LA":GOSUB 1390
920 IF EE$<>DD$ THEN 925 ELSE 930
925 PRINT"YOU STUMBLE OUT, AND BLINDED BY THE SUDDEN LIGHT, WAND
ER ABOUT.":GOTO 790
930 PRINT"LUCKILY,YOU HAVE A LAMP AND CAN SEE.":GG$="ROPE":HH$="
SHOVEL":GOSUB 515
935 GOSUB 1420
940 IF LL>6 THEN 960
945 LL=0
950 GG$="ROPE":HH$="SHOVEL"
955 GOSUB 1485
960 PRINT"THERE ARE EXITS WEST AND SOUTH":KK=KK+1
965 GOSUB 665
970 IF A$="W"THEN 985 ELSEIF A$="S"THEN 995 ELSE PRINT"CAN'T GO
THAT WAY."
975 GOSUB665
980 GOTO 970
985 PRINT"YOU GO 40 FT. WEST AND COME TO  A ROOM.":IF L2=0 THEN
840 ELSE PRINT"IT'S EMPTY."
990 GOTO880
995 PRINT"YOU GO 30 FT. SOUTH."
1000 PRINT"YOU ARE NOW IN AN INTERSECTION  GOING EAST,WEST,AND N
ORTH.":GOSUB 665
1005 IF A$="E"THEN 1195 ELSE IF A$="W"THEN 1030 ELSE IF A$="N"TH
EN 1020 ELSE PRINT"CAN'T GO THAT WAY."
1010 GOSUB665
1015 GOTO 1005
1020 PRINT"YOU GO 30 FT.NORTH AND FIND     YOURSELF IN A ROOM.":
IF KK=0 THEN 915 ELSE PRINT"IT'S EMPTY."
1025 GOTO960
1030 PRINT"YOU GO 50 FT. WEST AND FIND     YOURSELF IN A ROOM.":
IF MM=0 THEN 1040 ELSE PRINT"IT'S EMPTY."
1035 GOTO1080
1040 PRINT"THIS ROOM IS A GIANT PIT!":EE$="RO":GOSUB 1390
1045 IF EE$<>DD$ THEN 1050 ELSE 1055
1050 PRINT"THERE IS NO WAY TO CLIMB DOWN.  YOU LEAVE.  YOU GO 50
 FT.EAST.":GOTO 1000
1055 PRINT"SINCE YOU HAVE A ROPE,YOU MAKE  A LADDER AND CLIMB DO
WN.":GG$="LAMP":HH$="SHOVEL":GOSUB 515
1060 GOSUB 1420
1065 IF FF<6 THEN 1080
1070 GG$="LAMP":HH$="SHOVEL"
1075 GOSUB 1485
1080 PRINT"THERE ARE EXITS SOUTH AND EAST.":MM=MM+1
1085 GOSUB 665
1090 IF A$="S"THEN 1110 ELSE IF A$="E"THEN 1105 ELSE PRINT"CAN'T
 GO THAT WAY."
1095 GOSUB 665
1100 GOTO 1090
1105 PRINT"YOU GO 50 FT.EAST.":GOTO 1000
1110 PRINT"YOU GO 70 FT. SOUTH AND THE     PASSAGEWAY TURNS WEST
.":PRINT"YOU GO 30 FT. WEST AND IT TURNS NORTH.":PRINT"YOU GO 10
 FT. NORTH AND COME TO A ROOM.":IF NN=0 THEN 1120 ELSE PRINT"IT'
S EMPTY."
1115 GOTO1150
1120 GG$="ROPE":HH$="DAGGER":GOSUB515
1125 GOSUB 1420
1130 IF LL>6 THEN 1150
1135 LL=0
1140 GG$="ROPE":HH$="DAGGER"
1145 GOSUB 1485
1150 PRINT"THERE ARE EXITS NORTH AND SOUTH.":NN=NN+1
1155 GOSUB 665
1160 IF A$="N"THEN1180
1165 IF A$="S"THEN1185
1170 PRINT"CAN'T GO THAT WAY!":GOSUB665
1175 GOTO 1160
1180 PRINT"YOU GO 40 FT.NORTH.":GOTO 790
1185 PRINT"YOU GO 10 FT.SOUTH AND THE      PASSAGEWAY TURNS EAST
.":PRINT"YOU GO 30 FT.EAST AND IT TURNS  NORTH.":PRINT"YOU GO 70
 FT.NORTH AND COME TO  A ROOM.":IF MM=0 THEN 1040 ELSE PRINT"IT'
S EMPTY."
1190 GOTO1080
1195 PRINT"YOU GO 70 FT.EAST AND COME TO A ROOM.":IF OO=0 THEN 1
200 ELSE PRINT"IT'S EMPTY.":GOTO 1260
1200 PRINT"THE FLOOR IS COVERED WITH MUD   WHICH HAS DRIFTED IN
FROM THE   OCEAN FLOOR.":PRINT"THEN YOU NOTICE..."
1205 GOSUB 515
1210 GOSUB 1420
1215 IF LL>6 THEN 1260
```

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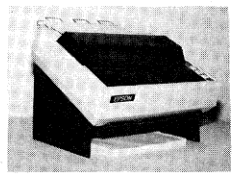

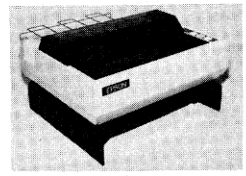

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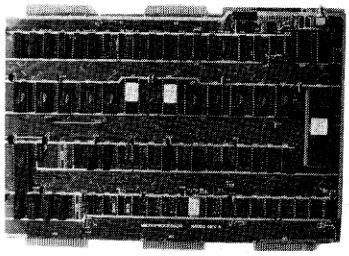

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Listing continued

```
1220 LL=0
1225 PRINT"YOU TRIP ON SOMETHING HARD      UNDER THE MUD.":EE$="
SH":GOSUB 1390
1230 IF EE$<>DD$ THEN 1235 ELSE 1240
1235 PRINT"AS YOU DON'T HAVE ANYTHING TO   DIG WITH,YOU MUST LEA
VE.":GOTO 1260
1240 PRINT"GOOD!  YOU HAVE A SHOVEL TO DIG WITH.  YOU FIND A FIN
E SWORD    INLAID WITH GEMS.  AN INSCRIP-  TION ON THE HILT SAYS
:"
1245 PRINT:PRINT"     **SWORD OF ANDON**"
1250 PRINT"    **DOWN WITH KRAKENS**"
1255 PRINT"  **GOOD LUCK, TRAVELER!**":PRINT
1260 PRINT"THERE ARE EXITS EAST AND WEST.":OO=OO+1
1265 GOSUB 665
1270 IF A$="E"THEN 1285 ELSE IF A$="W"THEN 1280 ELSE PRINT"CAN'T
 GO THAT WAY.":GOSUB 665
1275 GOTO 1270
1280 PRINT"YOU GO 70 FT.WEST.":GOTO 1000
1285 CLS:PRINT"YOU GO 60 FT.EAST AND COME TO A ROOM.":R$="KRAKEN
":S=1:T=10
1290 PRINT"AS YOU ENTER THIS GIANT ROOM YOUSEE A LOVELY GIRL IN
A CAGE.":PRINT"SUDDENLY,A HUGE WALL SLIDES     SHUT,COVERING YOU
R ONLY ESCAPE!"
1295 PRINT"THEN YOU SEE THE HIDEOUS        KRAKEN.  YOU PREPARE
TO ATTACK!":PRINT:PRINT"PRESS THE SPACE BAR TO CHARGE,":PRINT B$
"!"
1300 I$=INKEY$
1305 IF I$<>" " THEN 1300
1310 GOSUB 560
1315 PRINTSTRING$(32,"*");:PRINTTAB(15-LEN(B$)/2)B$:PRINT"
     THE VICTOR":PRINTSTRING$(32,"*")
1320 FOR T=1 TO 1000:NEXT T
1325 CLS:PRINT"  SINCE YOU HAVE KILLED THE     KRAKEN, THE CAGE
DISAPPEARS AND THE BEAUTIFUL GIRL IS FREED!"
1330 PRINT"SHE IS THE PRINCESS OF THESE    WATERS, AND CAN NOW R
ULE THEM   IN PEACE."
1335 PRINT"  SHE PRESSES A BUTTON ON ONE   WALL AND THE CEILING
SLIDES     BACK.  WITH A WHISTLING CALL,   SHE SUMMONS A GIANT T
ORTOISE."
1340 PRINT"  PRESS ANY KEY FOR THE END OF  THE STORY."
1345 I$=INKEY$
1350 IF I$="" THEN 1345
1355 CLS:PRINT"  WITH THE TORTOISE'S HELP, SHE MOVES ASIDE A GRE
AT ROCK THAT   THE KRAKEN HAD SET IN PLACE, RE-VEALING A WEALTH
OF TREASURE."
1360 PRINT"  HEAVILY LADEN WITH RARE TREAS-URES, YOU CLIMB ABOAR
D SIR      TORTOISE'S BACK AND HE BRINGS   YOU TO THE SURFACE."
1365 PRINT:PRINT"  YOU MARRY AND LIVE HAPPILY UN-TIL THE END OF
YOUR DAYS."
1370 PRINT:INPUT"WANT TO PLAY AGAIN";A$
1375 IF LEFT$(A$,1)="Y"THEN CLS ELSE 1385
1380 RUN150
1385 PRINT"CHICKEN":GOTO 1385
1390 BB=LEN(Z$)
1395 FOR CC=1 TO BB-1 STEP 2
1400 DD$=MID$(Z$,CC,2)
1405 IF DD$=EE$THEN RETURN
1410 NEXT CC
1415 RETURN
1420 PRINT"THERE'S A "R$" IN HERE!"
1425 INPUT"WOULD YOU LIKE TO 1)FIGHT OR    2)RUN";A$
1430 IF A$="1"OR A$="2" THEN 1440
1435 PRINT"PLEASE USE 1 OR 2":GOTO 1425
1440 IF A$="1" THEN GOSUB 560 ELSE 1450
1445 RETURN
1450 FF=RND(-TIMER):FF=RND(10)
1455 IF FF<6 THEN 1460 ELSE 1465
1460 PRINT"YOU GOT AWAY!":RETURN
1465 CLS:PRINT"THE "R$" CAUGHT YOU!":PRINT"YOU'RE FORCED TO FIGH
T ANYWAY!"
1470 FOR T=1 TO 750:NEXT T
1475 GOSUB 560
1480 FF=10:LL=10
1485 PRINT"IN THIS ROOM THERE IS A "GG$" AND A "HH$" ."
1490 INPUT"TYPE IN THE FIRST TWO LETTERS OFTHE ONE YOU WISH";A$:
IF A$=LEFT$(GG$,2)OR A$=LEFT$(HH$,2) THEN 1500
1495 PRINT"PLEASE USE "LEFT$(GG$,2)" OR "LEFT$(HH$,2)" .":GOTO 1
490
1500 IF A$=LEFT$(GG$,2) THEN II$=GG$ ELSE II$=HH$
1505 PRINT"THE "II$" IS TAKEN."
1510 Z$=Z$+A$
1515 JJ$=JJ$+II$+","
1520 RETURN
1525 PRINT"I'M AFRAID YOU'RE DEAD!":GOTO 1370
1530 DATA GIANT CRAB,2,4,GIANT PIRAHNA,6,3,SEA HYDRA,4,5,GIANT O
CTOPUS,7,6,SEA SERPENT,5,7,SEA DRAGON,3,8
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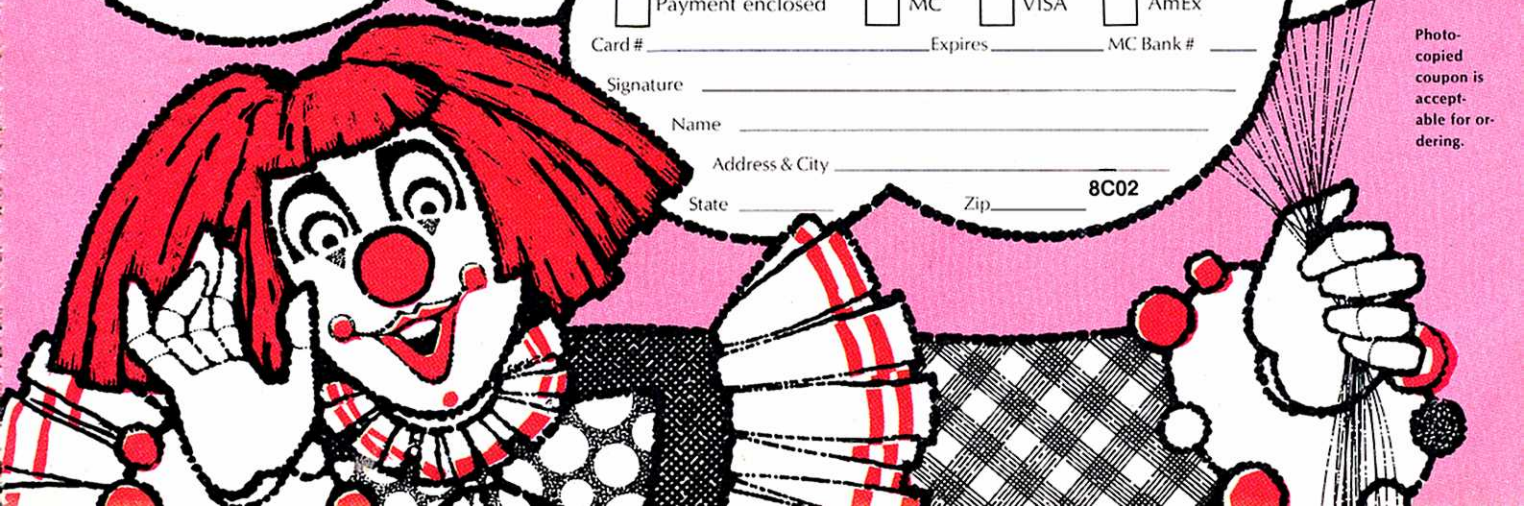

Byte Cycles

by Nathan Miller
Second Place
10 and under

Byte-Cycles is a one- or two-person joystick game for people of all ages. The object of the game is to fill as much of the screen as you can with the trail of your byte-cycle while avoiding the trail of your opponent's byte-cycle. You can win by forcing your opponent into your trail or into a wall. Variations include a screen filled with an array of stars you must avoid, and a circle-triangle-star maze you must negotiate to win.

After loading Byte-Cycles from the cassette, type Run and press the enter key. The program will print information on how to play Byte-Cycles. Whenever there is a pause and you are finished reading, press any key.

After the instructions, you will need to answer a few questions before play begins:

- *1 or 2 players?* Your answer to this question tells whether you want to compete with someone or practice alone.
- *Draw?* If you answer yes to this question, you will be able to cross trails and hit walls. This is usually for fun or practice, not competition.
- *Stars?* If you want the screen to be filled with a lot of dots, answer yes here. You will be asked for the number of dots to be used. If you hit the dots during play you are destroyed.
- *Circle, triangle, star?* In this option, the screen shows two half circles with gaps at each side. Inside the circles is a triangle with a star inside. The object is to get into the triangle and hit the star. This is very hard!

When using the joystick, you must be very careful to keep the handle against the rim. You can move in any of eight directions: up, down, left, right, and the four diagonals. To change directions, move the handle to the extreme position of the direction you want. Leaving the handle in the middle of the joystick will destroy you. Also, you must not reverse directions. To go the opposite way, make a small corner since reversing directly will explode you. ■

Nathan Miller, age 10, can be reached at 3309 SW Malcolm Court, Portland, OR 97225.

Program Listing

```
0 DIM HF(63),VF(63),FH(63),FV(63),A(50)
20 HF(0)=-1:VF(0)=-1:HF(63)=1:VF(63)=1:FH(0)=-1:FV(0)=-1:FH(63)=
1:FV(63)=1
23 CLS
25 PRINT"WHEN THERE IS A PAUSE AND YOU ARE READY TO CONTINUE, PR
ESS ANY KEY."
27 IF INKEY$="" THEN 27
30 CLS
40 PRINT"WELCOME TO BYTE CYCLES":PRINT"WRITTEN BY NATHAN MILLER"
:PRINT"OCT. 13,1982"
50 IF INKEY$="" THEN 50
60 CLS
70 PRINT"IMAGINE YOURSELF INSIDE A COMPUTER. YOU ARE PLACED ON A
 LARGE FIELD IN A CYCLE THAT LEAVES A TRAIL WHEN IT MOVES. YOUR
MAIN CONSIDERATION IS TO DESTROY THE OPPONENT BY MAKING HIM RUN
INTO A TRAIL OR FORCING HIM INTO THE WALL. AT THE SA";
80 PRINT"ME TIME YOU MUST AVOID THE TRAILS AND WALLS. WITH THE S
TAR OPTION, YOU AND YOUR OPPONENT CAN BE DESTROYED BY RUNNING IN
TO A STAR. IN THIS SIMULATION PLAYERS CONTROL THEIR CYCLES WITH
JOYSTICKS BUT THEY MUST HOLD JOYSTICKS ON THE RIM OR EXPLODE
100 IF INKEY$="" THEN 100
110 CLS
```

Listing continues

The Key Box

Color Computer
16K RAM
Extended Color Basic
Two Joysticks

Listing continued

```
120 INPUT"1 OR 2 PLAYERS";NP
130 IF NP<1 OR NP>2 THEN 120
140 INPUT"DRAW";D$
150 IF D$="YES" THEN PMODE 4,1:PCLS:SCREEN 1,1:GOTO 810
160 IF NP=2 THEN INPUT"RIGHT PERSON'S NAME";R$:INPUT"LEFT PERSON
'S NAME";L$
170 INPUT"STARS";S$
180 IF S$="YES" THEN INPUT"HOW MANY STARS";NS
190 IF S$<>"YES" THEN INPUT"CIRCLE,TRI.,STAR";CT$
200 PMODE 4,1:PCLS:SCREEN 1,1
240 LINE(0,0)-(255,191),PSET,B
250 ON NP GOSUB 260,370
260 PCLS:LINE(0,0)-(255,191),PSET,B:X=128:Y=96:IF S$="YES" THEN
270 ELSE 280
270 X=128:Y=96:FOR XZ=1 TO NS:PSET(RND(128)*2,RND(96)*2):NEXT XZ
280 IF CT$="YES" THEN 290 ELSE X=128:Y=96:GOTO 320
290 X=208:Y=171:CIRCLE(128,96),50,,.85,.04,.47:CIRCLE(128,96),50
,,.85,.53,.99:CIRCLE(128,96),49,,.85,.04,.47:CIRCLE(128,96),49,,
.85,.53,.99
300 PSET(128,96)
310 DRAW"BM128,96S8BM-5,+2E5F5BL3L4":DRAW"BM128,96BM-6,+2E6F6"
319 X=208:Y=171
320 H=JOYSTK(0):V=JOYSTK(1)
330 PSET(X,Y)
340 X=X+HF(H):Y=Y+VF(V)
350 IF PPOINT(X,Y)=5 THEN 700
360 GOTO 320
370 X2=88:Y=96:X=168:Y2=96:IF S$="YES" THEN 380 ELSE 390
380 X=88:Y=96:X2=168:Y2=96:FOR XZ=1 TO NS:PSET(RND(128)*2,RND(96
)*2):NEXT XZ
390 IF S$<>"YES" AND CT$="YES" THEN 400 ELSE X=88:X2=168:Y=96:Y2
=96:GOTO 420
400 X=48:Y=171:X2=208:Y2=171:CIRCLE(128,96),50,,.85,.04,.47:CIRC
LE(128,96),50,,.85,.53,.99:CIRCLE(128,96),49,,.85,.04,.47:CIRCLE
(128,96),49,,.85,.53,.99
410 DRAW"BM128,96S8BM-5,+2E5F5BL3L4":PSET(128,96)
419 X=28:Y=171:X2=208:Y2=171:LINE(0,0)-(255,191),PSET,B
420 H2=JOYSTK(0):V2=JOYSTK(1):H=JOYSTK(2):V=JOYSTK(3)
430 PSET(X,Y):PSET(X2,Y2)
440 X=X+HF(H):Y=Y+VF(V):X2=X2+FH(H2):Y2=Y2+FV(V2)
450 IF PPOINT(X,Y)=5 THEN 700
460 IF PPOINT(X2,Y2)=5 THEN 750
470 GOTO 420
480 X=128:Y=96
490 H=JOYSTK(0):V=JOYSTK(1)
500 X=X+HF(H):Y=Y+VF(V)
510 IF X<0 THEN X=0
520 IF Y<0 THEN Y=0
530 IF X>255 THEN X=255
540 IF Y>191 THEN Y=191
550 PSET(X,Y)
560 GOTO 490
570 X=88:Y=96:X2=168:Y2=96
580 H=JOYSTK(0):V=JOYSTK(1):H2=JOYSTK(2):V2=JOYSTK(3)
590 X=X+HF(H):Y=Y+VF(V):X2=X2+HF(H2):Y2=Y2+VF(V2)
600 IF Y2>191 THEN Y2=191
610 IF Y2<0 THEN Y2=0
620 IF X2>255 THEN X2=255
630 IF X<0 THEN X=0
640 IF X>255 THEN X=255
650 IF Y<0 THEN Y=0
660 IF Y>191 THEN Y=191
670 IF X2<0 THEN X2=0
680 PSET(X,Y):PSET(X2,Y2)
690 GOTO 580
700 FOR R=1 TO 20:CIRCLE(X,Y),R,,.85:NEXT
710 ZX=ZX+1:IF ZX<=4 THEN 730
720 IF NP=2 THEN 820 ELSE CLS:ZX=0:C=0:GOTO 120
730 PCLS:IF NP=1 AND CT$="YES" THEN PCLS:LINE(0,0)-(255,191),PSE
T,B:GOTO 290 ELSE IF NP=1 AND S$="YES" THEN PCLS:LINE(0,0)-(255,
191),PSET,B:GOTO 270 ELSE IF NP=2 AND CT$="YES" THEN 400 ELSE IF
 NP=2 AND S$="YES" THEN LINE(0,0)-(255,191),PSET,B:GOTO 380
731 IF NP=1 AND CT$<>"YES" AND S$<>"YES" THEN X=128:Y=96:GOTO 32
0 ELSE X=88:Y=96:X2=168:Y2=96:LINE(0,0)-(255,191),PSET,B:GOTO 42
0
740 GOTO 370
750 FOR R=1 TO 20:CIRCLE(X2,Y2),R,,.85:NEXT R
760 FOR D=1 TO 250:NEXT
770 C=C+1:IF C<=4 THEN 730
790 IF NP=2 THEN 820 ELSE CLS:ZX=0:C=0:GOTO 120
800 GOTO 120
810 IF NP=1 THEN 480 ELSE 570
820 IF ZX>XZ THEN 850 ELSE 830
830 CLS:PRINT"CONGRATULATIONS,";L$;", YOU WIN!"
840 IF INKEY$="" THEN 840 ELSE CLS:ZX=0:C=0:GOTO 120
850 CLS:PRINT"CONGRATULATIONS,";R$;", YOU WIN!"
855 PRINT:PRINT:PRINT:PRINT"FOR ANOTHER GAME PRESS ANY KEY."
860 IF INKEY$="" THEN 860 ELSE CLS:ZX=0:C=0:GOTO 120
```


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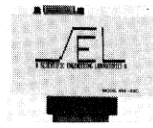

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Boxer

by Lloyd Kupchanko
Third Place
14–18

Boxer is a machine-language game that will give your reflexes the ultimate challenge. The object is to punch a randomly appearing bag. Use the up- and down-arrow keys to move and the left- and right-arrow keys to punch.

Listing 1 is a Basic version of Boxer. String packing was used to do the animation. After you have played a few games and leave the computer, the game will go into the demonstration mode. To exit the demonstration mode just hit any key. Even though I did almost everything possible to speed up the game, it still runs pretty slowly.

Listing 2 is an Assembly-language version of Boxer. The only difference between the Basic version and this one is that the Basic program has a demonstration mode and the Assembly-language program does not. Boxer requires 32K of memory to assemble. To use this version you have to run Program Listing 3 first. This program POKEs random numbers into a large memory block. The machine-language program will then use these numbers to randomly position the bag you are supposed to punch.

My high score is 720 points. ■

Program Listing 1

```
1 '  ********************************************************
2 '  *                                                      *
3 '  *                    B  O  X  E  R                     *
4 '  *                                                      *
5 '  *                        B Y                           *
6 '  *                                                      *
7 '  *            L L O Y D   K U P C H A N K O             *
8 '  *                                                      *
9 '  ********************************************************
10 GOTO470
15 '  ***** TESTS FOR KEYBORD INPUT
20 A=PEEK(14550)
30 IFT<0THEN320ELSET=T-1
40 IFV<0THEN230ELSEV=V-1
45 '  ***** IF IN DEMONSTRATION MODE THEN LINE 450
50 IFD=1THEN450
60 IFA=32THEN110
70 IFA=64THEN130
80 IFA=8THEN150
90 IFA=16THEN190
100 GOTO20
105 '  ***** RIGHT HAND SWING ROUTINE
110 V=V-1:T=T-1:PRINT@X,A1$;:PRINT@X,A2$;:PRINT@X,A3$;:PRINT@X,A
4$;:IFPEEK(15370+X)=191THEN250ELSEIFPEEK(15434+X)=191THEN250
115 '  ***** RIGHT HAND MISS ROUTINE
120 PRINT@X,Z$;:PRINT@X,A3$;:PRINT@X,Z$;:PRINT@X,A2$;:PRINT@X,Z$
;:PRINT@X,A1$;:PRINT@X,Z$;:PRINT@X,A0$;:GOTO20
125 '  ***** LEFT HAND SWING ROUTINE
130 V=V-1:T=T-1:PRINT@Y,A6$;:PRINT@Y,A7$;:PRINT@Y,A8$;:PRINT@Y,A
```

Listing 1 continues

Lloyd Kupchanko, age 16, can be reached at 24 Quesnell Circle, Edmonton, Alberta, Canada T5R 5M9.

The Key Box

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Listing 1 continued

```
9$;:IFPEEK(15562+X)=191THEN280ELSEIFPEEK(15626+X)=191THEN280
135 '  ***** LEFT HAND MISS ROUTINE
140 PRINT@Y,Z$;:PRINT@Y,A8$;:PRINT@Y,Z$;:PRINT@Y,A7$;:PRINT@Y,Z$
;:PRINT@Y,A6$;:PRINT@Y,Z$;:PRINT@Y,A5$;:GOTO20
145 '  ***** MOVE UP ROUTINE
150 PRINT@X-1,Z1$;:X=X-64:Y=Y-64
160 IFX<64THENX=X+64:Y=Y+64
170 PRINT@X,M$;
180 T=T-1:GOTO20
185 '  ***** MOVE DOWN ROUTINE
190 PRINT@X-1,Z1$;:X=X+64:Y=Y+64
200 IFX>687THENX=X-64:Y=Y-64
210 PRINT@X,M$;
220 T=T-1:GOTO20
225 '  ***** ERASES BLOCK WHEN BOXER TAKES TO LONG
230 PRINT@P,STRING$(3,128);:S=S-20:GOSUB310:V=10:P=RND(14)*64+14
:PRINT@P,STRING$(3,191);:GOTO20
235 '  ***** DRAWS NEW BLOCK AFTER BOXER HAS HIT
240 V=10:P=RND(14)*64+14:PRINT@P,STRING$(3,191);:GOTO20
245 '  ***** RIGHT HAND HIT ROUTINE
250 PRINT@P," ";:PRINT@X,Z$;:PRINT@P+1," ";:PRINT@X,A3$;:PRINT@P
+2," ";:PRINT@X,Z$;:PRINT@P+6,CHR$(191);:PRINT@X,A2$;:PRINT@P+7,
CHR$(191);:PRINT@X,Z$;:PRINT@P+8,CHR$(191);
260 PRINT@X,A1$;:PRINT@P+6," ";:PRINT@P+9,CHR$(191);:PRINT@X,Z$;
:PRINT@P+7," ";:PRINT@P+10,CHR$(191);:PRINT@X,A0$;:PRINT@P+8," "
;:PRINT@P+11,CHR$(191);:PRINT@P+9," ";:S=S+10:PRINT@P+10," ";
270 PRINT@P+11," ";:GOSUB310:GOTO240
275 '  ***** LEFT HAND HIT ROUTINE
280 PRINT@P," ";:PRINT@Y,Z$;:PRINT@P+1," ";:PRINT@Y,A8$;:PRINT@P
+2," ";:PRINT@Y,Z$;:PRINT@P+6,CHR$(191);:PRINT@Y,A7$;:PRINT@P+7,
CHR$(191);:PRINT@Y,Z$;:PRINT@P+8,CHR$(191);
290 PRINT@Y,A7$;:PRINT@P+6," ";:PRINT@P+9,CHR$(191);:PRINT@Y,Z$;
:PRINT@P+7," ";:PRINT@P+10,CHR$(191);:PRINT@Y,A5$;:PRINT@P+8," "
;:PRINT@P+11,CHR$(191);:PRINT@P+9," ";:S=S+10:PRINT@P+10," ";
300 PRINT@P+11," ";:GOSUB310:GOTO240
305 '  ***** FLASHES GRAPHICS NEAR THE SCORE
310 PRINT@556,CHR$(191);:PRINT@492,CHR$(191);:PRINT@556,CHR$(128
);:PRINT@492,CHR$(143);:PRINT@556,S;:RETURN
315 '  ***** DELAY LOOP AND GRAPHICS DISPLAY AT END OF GAME
320 FORB=1TO500:NEXT:CLS:PRINT@540,"GAME OVER":FORB=1TO400:NEXTB
:FORX=191TO128STEP-1:POKE15360,X:Q=USR(0):NEXT
330 GOSUB1150:PRINT@528,"YOUR SCORE :"S;:IFS>HSTHENHS=S:PRINT"
  A NEW HIGH SCORE !!";
335 '  ***** AFTER GAME DISPLAY OF SCORE AND HIGH SCORE
340 PRINT@592,"HIGH SCORE :"HS;
350 PRINT@720,"DO YOU WISH TO PLAY AGAIN (Y/N)";
360 C=C+1:IFC=250THEN430ELSEQ$=INKEY$
370 PRINT@747," / ";
380 GOSUB460:PRINT@747,"Y/N";
390 IFQ$=""THEN360
400 IFQ$="Y"THEND=0:GOTO1090
410 IFQ$="N"THEN440
420 GOTO360
430 D=1:GOTO1090
440 END
445 '  ***** RANDOM CHOICE FOR DEMONSTRATION MODE
450 Q$=INKEY$:IFQ$<>""THEN320ELSEQ=RND(4):ONQGOTO110,130,150,190

455 '  ***** DELAY LOOP SUBROUTINE
460 FORB=1TO15:NEXT:RETURN
465 '  ***** START OF TITLE DISPLAY
470 GOSUB1150:PRINT@346,"B O X E R";:PRINT@530,"USE THE "CHR$(91
)" ARROW TO MOVE UP";:PRINT@594,"USE THE "CHR$(92)" ARROW TO MOV
E DOWN";:PRINT@651,"USE THE "CHR$(93)" ARROW TO SWING WITH THE R
IGHT HAND";
480 PRINT@715,"USE THE "CHR$(94)" ARROW TO SWING WITH THE LEFT H
AND";
490 CLEAR200:DEFINTA-Z
495 '  ***** LINES 500 - 1020 POKE THE DATA INTO STRINGS
496 '  ***** 37 X'S
500 Z$="XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
510 K=VARPTR(Z$):AD=PEEK(K+2)*256+PEEK(K+1)
520 DATA128,128,128,128,128,128,128,128,128,128,128,128,26,24,24
,24,24,24,24,24,24,24,24,24,24,128,128,128,128,128,128,128,128,1
28,128,128,128
530 FORB=0TO36:READQ:POKEAD+B,Q:NEXT
535 '  ***** 21 X'S
540 Z2$="XXXXXXXXXXXXXXXXXXXX"
550 K=VARPTR(Z2$):AD=PEEK(K+2)*256+PEEK(K+1)
560 DATA128,128,128,128,128,128,128,128,128,128,24,24,24,24,24,2
4,24,24,24,24,26
570 FORB=0TO20:READQ:POKEAD+B,Q:NEXT
580 Z1$=Z2$+Z2$+Z2$+Z2$+Z2$
585 '  ***** 19 X'S
590 A0$="XXXXXXXXXXXXXXXXXX"
600 K=VARPTR(A0$):AD=PEEK(K+2)*256+PEEK(K+1)
610 DATA128,176,176,184,188,180,26,24,24,24,24,24,24,158,167,128
,130,131,129
```

Listing 1 continues

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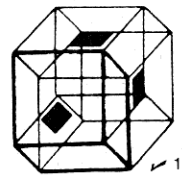

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Listing 1 continued

```
620 FORB=0TO18:READQ:POKEAD+B,Q:NEXT
625 '  ***** 22 X'S
630 A1$="XXXXXXXXXXXXXXXXXXXXXX"
640 K=VARPTR(A1$):AD=PEEK(K+2)*256+PEEK(K+1)
650 DATA128,128,128,128,160,176,144,26,24,24,24,24,24,24,24,24,158,
175,131,131,139,143,135
660 FORB=0TO21:READQ:POKEAD+B,Q:NEXT
665 '  ***** 25 X'S
670 A2$="XXXXXXXXXXXXXXXXXXXXXXXXX"
680 K=VARPTR(A2$):AD=PEEK(K+2)*256+PEEK(K+1)
690 DATA128,128,128,128,128,160,176,144,26,24,24,24,24,24,24,24,
24,158,175,131,131,131,139,143,135
700 FORB=0TO24:READQ:POKEAD+B,Q:NEXT
705 '  ***** 28 X'S
710 A3$="XXXXXXXXXXXXXXXXXXXXXXXXXXXX"
720 K=VARPTR(A3$):AD=PEEK(K+2)*256+PEEK(K+1)
730 DATA128,128,128,128,128,128,160,176,144,26,24,24,24,24,24,24
,24,24,24,156,175,131,131,131,131,139,143,135
740 FORB=0TO27:READQ:POKEAD+B,Q:NEXT
745 '  ***** 31 X'S
750 A4$="XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
760 K=VARPTR(A4$):AD=PEEK(K+2)*256+PEEK(K+1)
770 DATA128,128,128,128,128,128,160,176,144,26,24,24,24,24,24,2
4,24,24,24,24,24,156,175,131,131,131,131,131,139,143,135
780 FORB=0TO30:READQ:POKEAD+B,Q:NEXT
785 '  ***** 19 X'S
790 A5$="XXXXXXXXXXXXXXXXXXX"
800 K=VARPTR(A5$):AD=PEEK(K+2)*256+PEEK(K+1)
810 DATA173,182,128,160,176,144,26,24,24,24,24,24,24,24,128,131,131
,139,143,135
820 FORB=0TO18:READQ:POKEAD+B,Q:NEXT
825 '  ***** 22 X'S
830 A6$="XXXXXXXXXXXXXXXXXXXXXX"
840 K=VARPTR(A6$):AD=PEEK(K+2)*256+PEEK(K+1)
850 DATA173,190,176,176,184,188,180,26,24,24,24,24,24,24,24,128,
128,128,128,130,131,129
860 FORB=0TO21:READQ:POKEAD+B,Q:NEXT
865 '  ***** 25 X'S
870 A7$="XXXXXXXXXXXXXXXXXXXXXXXXX"
880 K=VARPTR(A7$):AD=PEEK(K+2)*256+PEEK(K+1)
890 DATA173,190,176,176,176,184,188,180,26,24,24,24,24,24,24,24,
24,128,128,128,128,128,130,131,129
900 FORB=0TO24:READQ:POKEAD+B,Q:NEXT
905 '  ***** 28 X'S
910 A8$="XXXXXXXXXXXXXXXXXXXXXXXXXXXX"
920 K=VARPTR(A8$):AD=PEEK(K+2)*256+PEEK(K+1)
930 DATA141,190,176,176,176,184,188,180,26,24,24,24,24,24,24
,24,24,24,128,128,128,128,128,128,130,131,129
940 FORB=0TO27:READQ:POKEAD+B,Q:NEXT
945 '  ***** 31 X'S
950 A9$="XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
960 K=VARPTR(A9$):AD=PEEK(K+2)*256+PEEK(K+1)
970 DATA141,190,176,176,176,176,176,184,188,180,26,24,24,24,24,2
4,24,24,24,24,24,128,128,128,128,128,128,128,130,131,129
980 FORB=0TO30:READQ:POKEAD+B,Q:NEXT
985 '  ***** 56 X'S
990 M$="XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
"
1000 K=VARPTR(M$):AD=PEEK(K+2)*256+PEEK(K+1)
1010 DATA128,176,176,184,188,180,26,24,24,24,24,24,24,158,167,12
8,130,131,129,26,24,24,24,24,24,24,24,170,128,145,157,132,26,24,
24,24,24,173,182,128,160,176,144,26,24,24,24,24,24,24,128,131,13
1,139,143,135
1020 FORB=0TO55:READQ:POKEAD+B,Q:NEXT
1025 '  ***** POKE LSB FOR USR ROUTINE
1030 POKE16526,0
1035 '  ***** POKE MSB FOR USR ROUTINE
1040 POKE16527,125
1050 FORB=0TO11:READQ:POKE32000+B,Q:NEXT:PRINT@916,"PRESS <ENTER
> TO START";
1060 DATA33,0,60,17,1,60,1,255,3,237,176,201
1065 '  ***** IF TO LONG TO PRESS ENTER THAN GOTO DEMO
1070 C=C+1:IFC=500THEND=1:GOTO1090
1080 PRINT@922,"        ";:GOSUB460:Q$=INKEY$:PRINT@922,"<ENTER>"
;:GOSUB460:IFQ$=""THEN1070
1085 '  ***** PRINT GAME SCREEN
1090 GOSUB1150:FORX=17TO966STEP64:PRINT@X,STRING$(11,191);:NEXT:
PRINT@977,STRING$(11,191);
1100 FORB=84TO969STEP64:PRINT@B,STRING$(6,128);:NEXT
1110 PRINT@550,"SCORE:";:PRINT@540,STRING$(9,143);:PRINT@549,CHR
$(191);:PRINT@620,CHR$(143);:PRINT@492,CHR$(143);:PRINT@485,CHR$
(191);:PRINT@486,STRING$(6,131);:PRINT@613,CHR$(143);:PRINT@614,
STRING$(6,140);
1120 X=452:Y=644:T=500:S=0:C=0
1130 PRINT@X,M$;
1140 GOTO240
1145 '  ***** SUBROUTINE FOR DRAWING BORDER AROUND THE SCREEN
1150 CLS:FORB=15360TO15423:POKEB,131:POKEB+960,176:NEXT:FORB=153
60TO16320STEP64:POKEB,191:POKEB+63,191:NEXT:RETURN
```

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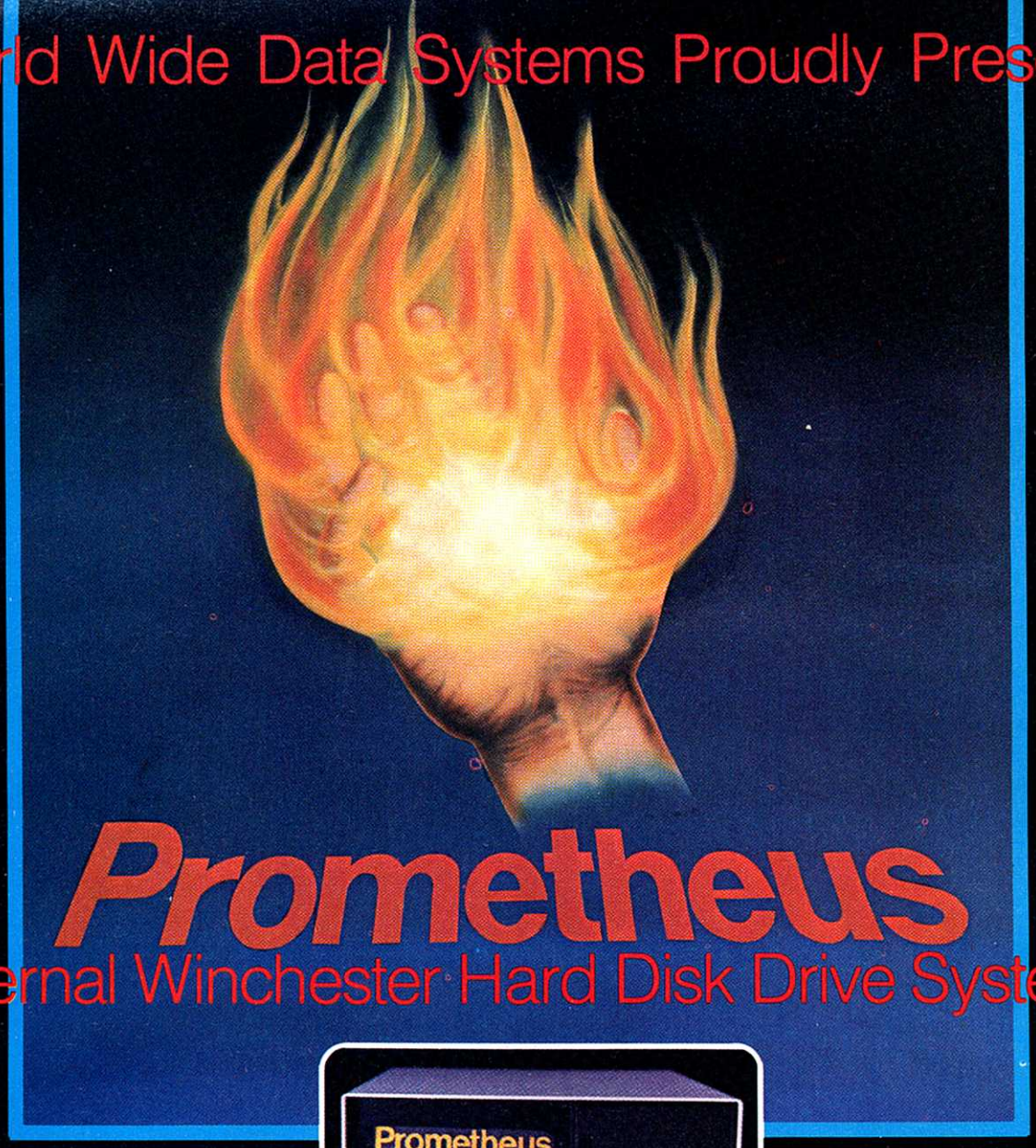

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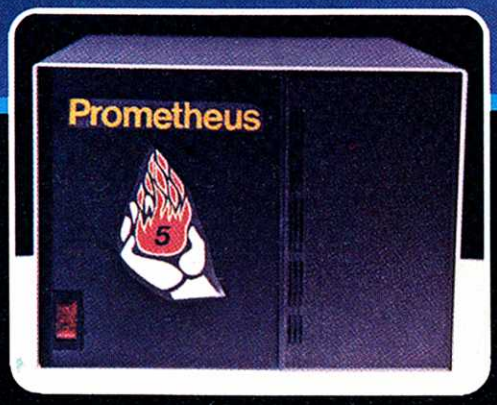

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Program Listing 2

```
B000            00100          ORG     0B000H
                00195 ;
                00196 ;        SET UP TITLE DISPLAY
                00197 ;
B000 CDC901     00200          CALL    01C9H           ;CLEAR SCREEN
B003 21F5B5     00210          LD      HL,INSTR
B006 115A3D     00220          LD      DE,15706
B009 CDE0B5     00230          CALL    PA
B00C 21FFB5     00240          LD      HL,INSTR1
B00F 11123E     00250          LD      DE,15890
B012 CDE0B5     00260          CALL    PA
B015 211AB6     00270          LD      HL,INSTR2
B018 11523E     00280          LD      DE,15954
B01B CDE0B5     00290          CALL    PA
B01E 2137B6     00300          LD      HL,INSTR3
B021 118B3E     00310          LD      DE,16011
B024 CDE0B5     00320          CALL    PA
B027 2164B6     00330          LD      HL,INSTR4
B02A 11CB3E     00340          LD      DE,16075
B02D CDE0B5     00350          CALL    PA
B030 2190B6     00360          LD      HL,PRESS
B033 11943F     00370          LD      DE,16276
B036 CDE0B5     00380          CALL    PA
B039 CD3EB0     00390          CALL    BOX
B03C 1834       00400          JR      BE
                00403 ;
                00406 ;        'BOX' DRAWS A BORDER AROUND THE SCREEN
                00409 ;
B03E 21013C     00410 BOX      LD      HL,15361
B041 11023C     00420          LD      DE,15362
B044 013D00     00430          LD      BC,61
B047 3683       00440          LD      (HL),131
B049 EDB0       00450          LDIR
B04B 21C13F     00460          LD      HL,16321
B04E 11C23F     00470          LD      DE,16322
B051 013D00     00480          LD      BC,61
B054 36B0       00490          LD      (HL),176
B056 EDB0       00500          LDIR
B058 DD21003C   00510          LD      IX,15360
B05C 011000     00520          LD      BC,16
B05F 114000     00530          LD      DE,64
B062 DD3600BF   00540 LP1      LD      (IX),191
B066 DD363FBF   00550          LD      (IX+63),191
B06A DD19       00560          ADD     IX,DE
B06C 0B         00570          DEC     BC
B06D 78         00580          LD      A,B
B06E B1         00590          OR      C
B06F C8         00600          RET     Z
B070 18F0       00610          JR      LP1
                00613 ;
                00616 ;        TEST FOR GAME START
                00619 ;
B072 018813     00620 BE       LD      BC,5000
B075 214038     00630 LP2      LD      HL,3840H
B078 7E         00640          LD      A,(HL)
B079 CB47       00650          BIT     0,A
B07B C2AFB0     00660          JP      NZ,START
B07E 0B         00670          DEC     BC
B07F 78         00680          LD      A,B
B080 B1         00690          OR      C
B081 2802       00700          JR      Z,ERASE
B083 18F0       00710          JR      LP2
B085 219A3F     00720 ERASE    LD      HL,16282
B088 119B3F     00730          LD      DE,16283
B08B 010600     00740          LD      BC,6
B08E 3680       00750          LD      (HL),128
B090 EDB0       00760          LDIR
B092 018813     00770          LD      BC,5000
B095 210438     00780 LP3      LD      HL,3804H
B098 7E         00790          LD      A,(HL)
B099 CB47       00800          BIT     0,A
B09B 2012       00810          JR      NZ,START
B09D 0B         00820          DEC     BC
B09E 78         00830          LD      A,B
B09F B1         00840          OR      C
B0A0 2802       00850          JR      Z,PRNT
B0A2 18F1       00860          JR      LP3
B0A4 21A7B6     00870 PRNT     LD      HL,ENTER
B0A7 119A3F     00880          LD      DE,16282
B0AA CDE0B5     00890          CALL    PA
B0AD 18C3       00900          JR      BE
                00903 ;
                00906 ;        SET UP THE SCREEN FOR THE GAME
                00909 ;
B0AF CDC901     00910 START    CALL    01C9H
B0B2 CD3EB0     00920          CALL    BOX
B0B5 21113C     00930          LD      HL,15377
B0B8 11123C     00940          LD      DE,15378
B0BB 010B00     00950          LD      BC,11
B0BE 36BF       00960          LD      (HL),191
B0C0 EDB0       00970          LDIR
B0C2 110E00     00980          LD      DE,14
B0C5 DD21513C   00990          LD      IX,15441
B0C9 DD3600BF   01000 LP4      LD      (IX),191
B0CD DD3601BF   01010          LD      (IX+1),191
B0D1 DD3602BF   01020          LD      (IX+2),191
```

Listing 2 continues

Listing 2 continued

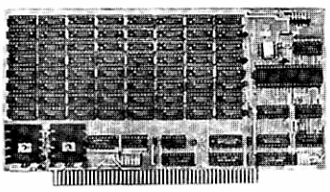
```
B0D5 DD3609BF 01030          LD      (IX+9),191
B0D9 DD360ABF 01040          LD      (IX+10),191
B0DD DD360BBF 01050          LD      (IX+11),191
B0E1 014000   01060          LD      BC,64
B0E4 DD09     01070          ADD     IX,BC
B0E6 7A       01080          LD      A,D
B0E7 B3       01090          OR      E
B0E8 1B       01100          DEC     DE
B0E9 20DE     01110          JR      NZ,LP4
B0EB 21D13F   01120          LD      HL,16337
B0EE 11D23F   01130          LD      DE,16338
B0F1 010B00   01140          LD      BC,11
B0F4 36BF     01150          LD      (HL),191
B0F6 EDB0     01160          LDIR
B0F8 21AFB6   01170          LD      HL,SC
B0FB DD21263E 01180          LD      IX,15910
B0FF CDE9B5   01190          CALL    PB
B102 DD360030 01200          LD      (IX),30H
B106 DD360130 01210          LD      (IX+1),30H
B10A DD360230 01220          LD      (IX+2),30H
B10E 211D3E   01230          LD      HL,15901
B111 111E3E   01240          LD      DE,15902
B114 010800   01250          LD      BC,8
B117 368F     01260          LD      (HL),143
B119 EDB0     01270          LDIR
B11B 21253E   01280          LD      HL,15909
B11E 36BF     01290          LD      (HL),191
B120 21E53D   01300          LD      HL,15845
B123 36BF     01310          LD      (HL),191
B125 216C3E   01320          LD      HL,15980
B128 368F     01330          LD      (HL),143
B12A 21EC3D   01340          LD      HL,15852
B12D 368F     01350          LD      (HL),143
B12F 21653E   01360          LD      HL,15973
B132 368F     01370          LD      (HL),143
B134 21E63D   01380          LD      HL,15846
B137 11E73D   01390          LD      DE,15847
B13A 010600   01400          LD      BC,6
B13D 3683     01410          LD      (HL),131
B13F EDB0     01420          LDIR
B141 21663E   01430          LD      HL,15974
B144 11673E   01440          LD      DE,15975
B147 010600   01450          LD      BC,6
B14A 368C     01460          LD      (HL),140
B14C EDB0     01470          LDIR
B14E C380B1   01480          JP      BEGIN
              01483 ;
              01486 ;        ROUTINE TO PRINT THE BOXER
              01489 ;
B151 21E3B6   01490 PBOXER   LD      HL,ARM0
B154 CDE9B5   01500          CALL    PB
B157 013A00   01510          LD      BC,58
B15A DD09     01520          ADD     IX,BC
B15C 23       01530          INC     HL
B15D CDE9B5   01540          CALL    PB
B160 2197B7   01550          LD      HL,HEAD
B163 013900   01560          LD      BC,57
B166 DD09     01570          ADD     IX,BC
B168 CDE9B5   01580          CALL    PB
B16B 013C00   01590          LD      BC,60
B16E DD09     01600          ADD     IX,BC
B170 213DB7   01610 P5       LD      HL,ARM5
B173 CDE9B5   01620          CALL    PB
B176 23       01630          INC     HL
B177 013A00   01640          LD      BC,58
B17A DD09     01650          ADD     IX,BC
B17C CDE9B5   01660          CALL    PB
B17F C9       01670          RET
B180 DD21C43D 01680 BEGIN    LD      IX,15812
B184 DDE5     01690          PUSH    IX
B186 CD51B1   01700          CALL    PBOXER
B189 DDE1     01710          POP     IX
              01713 ;
              01716 ;        MAIN PROGRAM LOOP
              01717 ;        TESTS FOR KEYBOARD INPUT
              01719 ;
B18B DDE5     01720 MOVE     PUSH    IX
B18D CDFFB4   01730          CALL    NB
B190 DDE1     01740          POP     IX
B192 214038   01750          LD      HL,3840H
B195 7E       01760          LD      A,(HL)
B196 CB5F     01770          BIT     3,A
B198 2017     01780          JR      NZ,UP
B19A CB67     01790          BIT     4,A
B19C 2036     01800          JR      NZ,DOWN
B19E CB6F     01810          BIT     5,A
B1A0 C22BB3   01820          JP      NZ,PRIGHT
B1A3 CB77     01830          BIT     6,A
B1A5 C265B2   01840          JP      NZ,PLEFT
B1A8 019411   01850          LD      BC,4500
B1AB CD94B3   01860          CALL    DLY
B1AE C38BB1   01870          JP      MOVE
              01873 ;
              01876 ;        MOVE UP ROUTINE
              01879 ;
B1B1 DDE5     01880 UP       PUSH    IX
B1B3 CD9AB3   01890          CALL    EBOXER
B1B6 DDE1     01900          POP     IX
B1B8 01C0FF   01910          LD      BC,-64
B1BB DD09     01920          ADD     IX,BC
B1BD DD7E00   01930          LD      A,(IX)
B1C0 FE83     01940          CP      131
B1C2 2838     01950          JR      Z,NUP
B1C4 DDE5     01960          PUSH    IX
B1C6 CD51B1   01970          CALL    PBOXER
B1C9 DDE1     01980          POP     IX
B1CB 01A00F   01990          LD      BC,4000
B1CE CD94B3   02000          CALL    DLY
B1D1 C38BB1   02010          JP      MOVE
              02013 ;
              02016 ;        MOVE DOWN ROUTINE
              02019 ;
B1D4 DDE5     02020 DOWN     PUSH    IX
B1D6 CD9AB3   02030          CALL    EBOXER
B1D9 DDE1     02040          POP     IX
B1DB 014001   02050          LD      BC,320
B1DE DD09     02060          ADD     IX,BC
B1E0 DD7E00   02070          LD      A,(IX)
B1E3 FEB0     02080          CP      176
B1E5 282A     02090          JR      Z,NDOWN
B1E7 0100FF   02100          LD      BC,-256
B1EA DD09     02110          ADD     IX,BC
B1EC DDE5     02120          PUSH    IX
B1EE CD51B1   02130          CALL    PBOXER
B1F1 DDE1     02140          POP     IX
B1F3 01A00F   02150          LD      BC,4000
B1F6 CD94B3   02160          CALL    DLY
B1F9 C38BB1   02170          JP      MOVE
B1FC 014000   02180 NUP      LD      BC,64
B1FF DD09     02190 LP5      ADD     IX,BC
B201 DDE5     02200          PUSH    IX
B203 CD51B1   02210          CALL    PBOXER
B206 DDE1     02220          POP     IX
B208 01D007   02230          LD      BC,2000
B20B CD94B3   02240          CALL    DLY
B20E C38BB1   02250          JP      MOVE
B211 01C0FE   02260 NDOWN    LD      BC,-320
B214 C3FFB1   02270          JP      LP5
              02273 ;
              02276 ;        PRINT THE ARMS (LEFT)
              02279 ;
B217 214BB7   02280 P6       LD      HL,ARM6
B21A CDE9B5   02290          CALL    PB
B21D 23       02300          INC     HL
B21E 013900   02310          LD      BC,57
B221 DD09     02320          ADD     IX,BC
B223 C321B3   02330          JP      FA
B226 215BB7   02340 P7       LD      HL,ARM7
B229 CDE9B5   02350          CALL    PB
B22C 23       02360          INC     HL
B22D 013800   02370          LD      BC,56
B230 DD09     02380          ADD     IX,BC
B232 C321B3   02390          JP      FA
B235 216DB7   02400 P8       LD      HL,ARM8
B238 CDE9B5   02410          CALL    PB
B23B 23       02420          INC     HL
B23C 013700   02430          LD      BC,55
B23F DD09     02440          ADD     IX,BC
B241 C321B3   02450          JP      FA
B244 2181B7   02460 P9       LD      HL,ARM9
B247 CDE9B5   02470          CALL    PB
B24A 23       02480          INC     HL
B24B 013600   02490          LD      BC,54
B24E DD09     02500          ADD     IX,BC
B250 C321B3   02510          JP      FA
B253 219DB7   02520 EA       LD      HL,BLANK
B256 CDE9B5   02530          CALL    PB
B259 013600   02540          LD      BC,54
B25C DD09     02550          ADD     IX,BC
B25E 219DB7   02560          LD      HL,BLANK
B261 CDE9B5   02570          CALL    PB
B264 C9       02580          RET
              02583 ;
              02586 ;        LEFT ARM PUNCH ROUTINE
              02589 ;
B265 DDE5     02590 PLEFT    PUSH    IX
B267 01C000   02600          LD      BC,192
B26A DD09     02610          ADD     IX,BC
B26C DDE5     02620          PUSH    IX
B26E DDE5     02630          PUSH    IX
B270 DDE5     02640          PUSH    IX
B272 DDE5     02650          PUSH    IX
B274 DDE5     02660          PUSH    IX
B276 DDE5     02670          PUSH    IX
B278 DDE5     02680          PUSH    IX
B27A DDE5     02690          PUSH    IX
B27C DDE5     02700          PUSH    IX
B27E DDE5     02710          PUSH    IX
B280 DDE5     02720          PUSH    IX
B282 CD17B2   02730          CALL    P6
B285 DDE1     02740          POP     IX
B287 CD26B2   02750          CALL    P7
B28A DDE1     02760          POP     IX
B28C CD35B2   02770          CALL    P8
B28F DDE1     02780          POP     IX
B291 CD44B2   02790          CALL    P9
B294 1E02     02800          LD      E,2
B296 DD7E01   02810          LD      A,(IX+1)
B299 FEBF     02820          CP      191             ;CHECK FOR HIT
B29B CA47B4   02830          JP      Z,HIT1
B29E DD7EC1   02840          LD      A,(IX-63)
```

Listing 2 continues

Listing 2 continued

```
B2A1 FEBF      02850          CP      191            ;CHECK FOR HIT
B2A3 CAB2B3    02860          JP      Z,HIT2
B2A6 DDE1      02870          POP     IX
B2A8 CD53B2    02880          CALL    EA
B2AB DDE1      02890          POP     IX
B2AD CD35B2    02900          CALL    P8
B2B0 DDE1      02910          POP     IX
B2B2 CD53B2    02920          CALL    EA
B2B5 DDE1      02930          POP     IX
B2B7 CD26B2    02940          CALL    P7
B2BA DDE1      02950          POP     IX
B2BC CD53B2    02960          CALL    EA
B2BF DDE1      02970          POP     IX
B2C1 CD17B2    02980          CALL    P6
B2C4 DDE1      02990          POP     IX
B2C6 CD53B2    03000          CALL    EA
B2C9 DDE1      03010          POP     IX
B2CB CD70B1    03020          CALL    P5
B2CE DDE1      03030          POP     IX
B2D0 01D007    03040          LD      BC,2000
B2D3 CD94B3    03050          CALL    DLY
B2D6 C38BB1    03060          JP      MOVE
               03063 ;
               03066 ;        PRINT ARMS (RIGHT)
               03069 ;
B2D9 21E3B6    03070 P0       LD      HL,ARM0
B2DC CDE9B5    03080          CALL    PB
B2DF 23        03090          INC     HL
B2E0 013A00    03100          LD      BC,58
B2E3 DD09      03110          ADD     IX,BC
B2E5 C321B3    03120          JP      FA
B2E8 21F1B6    03130 P1       LD      HL,ARM1
B2EB CDE9B5    03140          CALL    PB
B2EE 23        03150          INC     HL
B2EF 013900    03160          LD      BC,57
B2F2 DD09      03170          ADD     IX,BC
B2F4 C321B3    03180          JP      FA
B2F7 2101B7    03190 P2       LD      HL,ARM2
B2FA CDE9B5    03200          CALL    PB
B2FD 23        03210          INC     HL
B2FE 013800    03220          LD      BC,56
B301 DD09      03230          ADD     IX,BC
B303 C321B3    03240          JP      FA
B306 2113B7    03250 P3       LD      HL,ARM3
B309 CDE9B5    03260          CALL    PB
B30C 23        03270          INC     HL
B30D 013700    03280          LD      BC,55
B310 DD09      03290          ADD     IX,BC
B312 C321B3    03300          JP      FA
B315 2127B7    03310 P4       LD      HL,ARM4
B318 CDE9B5    03320          CALL    PB
B31B 23        03330          INC     HL
B31C 013600    03340          LD      BC,54
B31F DD09      03350          ADD     IX,BC
B321 CDE9B5    03360 FA       CALL    PB
B324 01D007    03370          LD      BC,2000
B327 CD94B3    03380          CALL    DLY
B32A C9        03390          RET
               03393 ;
               03396 ;        RIGHT ARM PUNCH ROUTINE
               03399 ;
B32B DDE5      03400 PRIGHT   PUSH    IX
B32D DDE5      03410          PUSH    IX
B32F DDE5      03420          PUSH    IX
B331 DDE5      03430          PUSH    IX
B333 DDE5      03440          PUSH    IX
B335 DDE5      03450          PUSH    IX
B337 DDE5      03460          PUSH    IX
B339 DDE5      03470          PUSH    IX
B33B DDE5      03480          PUSH    IX
B33D DDE5      03490          PUSH    IX
B33F DDE5      03500          PUSH    IX
B341 DDE5      03510          PUSH    IX
B343 CDE8B2    03520          CALL    P1
B346 DDE1      03530          POP     IX
B348 CDF7B2    03540          CALL    P2
B34B DDE1      03550          POP     IX
B34D CD06B3    03560          CALL    P3
B350 DDE1      03570          POP     IX
B352 CD15B3    03580          CALL    P4
B355 1E01      03590          LD      E,1
B357 DD7E01    03600          LD      A,(IX+1)
B35A FEBF      03610          CP      191            ;CHECK FOR HIT
B35C CA47B4    03620          JP      Z,HIT1
B35F DD7EC1    03630          LD      A,(IX-63)
B362 FEBF      03640          CP      191            ;CHECK FOR HIT
B364 CAB2B3    03650          JP      Z,HIT2
B367 DDE1      03660          POP     IX
B369 CD53B2    03670          CALL    EA
B36C DDE1      03680          POP     IX
B36E CD06B3    03690          CALL    P3
B371 DDE1      03700          POP     IX
B373 CD53B2    03710          CALL    EA
B376 DDE1      03720          POP     IX
B378 CDF7B2    03730          CALL    P2
B37B DDE1      03740          POP     IX
B37D CD53B2    03750          CALL    EA
B380 DDE1      03760          POP     IX
B382 CDE8B2    03770          CALL    P1
B385 DDE1      03780          POP     IX
B387 CD53B2    03790          CALL    EA
B38A DDE1      03800          POP     IX
B38C CDD9B2    03810          CALL    P0
B38F DDE1      03820          POP     IX
B391 C38BB1    03830          JP      MOVE
               03833 ;
               03836 ;        DELAY ROUTINE
               03839 ;
B394 0B        03840 DLY      DEC     BC
B395 78        03850          LD      A,B
B396 B1        03860          OR      C
B397 20FB      03870          JR      NZ,DLY
B399 C9        03880          RET
               03883 ;
               03886 ;        ERASE BOXER ROUTINE
               03889 ;
B39A 010500    03890 EBOXER   LD      BC,5
B39D DD2B      03900          DEC     IX
B39F 219DB7    03910 LP6      LD      HL,BLANK
B3A2 CDE9B5    03920          CALL    PB
B3A5 0B        03930          DEC     BC
B3A6 78        03940          LD      A,B
B3A7 B1        03950          OR      C
B3A8 2807      03960          JR      Z,EDONE
B3AA 113600    03970          LD      DE,54
B3AD DD19      03980          ADD     IX,DE
B3AF 18EE      03990          JR      LP6
B3B1 C9        04000 EDONE    RET
               04003 ;
               04006 ;        ONE OF THE HIT ROUTINES
               04009 ;
B3B2 DDE1      04010 HIT2     POP     IX
B3B4 DDE5      04020          PUSH    IX
B3B6 DD360A80  04030          LD      (IX+10),128
B3BA CD53B2    04040          CALL    EA
B3BD DDE1      04050          POP     IX
B3BF DD360B80  04060          LD      (IX+11),128
B3C3 CB43      04070          BIT     0,E
B3C5 C406B3    04080          CALL    NZ,P3
B3C8 CB4B      04090          BIT     1,E
B3CA C435B2    04100          CALL    NZ,P8
B3CD DDE1      04110          POP     IX
B3CF DD360C80  04120          LD      (IX+12),128
B3D3 CD53B2    04130          CALL    EA
B3D6 DDE1      04140          POP     IX
```

Listing 2 continues



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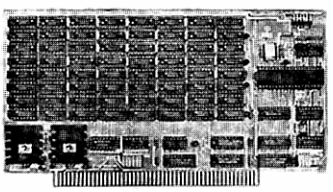

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Listing 2 continued

```
B3D8 DD3610BF 04150          LD      (IX+16),191
B3DC CB43     04160          BIT     0,E
B3DE C4F7B2   04170          CALL    NZ,P2
B3E1 CB4B     04180          BIT     1,E
B3E3 C426B2   04190          CALL    NZ,P7
B3E6 DDE1     04200          POP     IX
B3E8 DD3611BF 04210          LD      (IX+17),191
B3EC CD53B2   04220          CALL    EA
B3EF DDE1     04230          POP     IX
B3F1 DD3612BF 04240          LD      (IX+18),191
B3F5 CB43     04250          BIT     0,E
B3F7 C4E8B2   04260          CALL    NZ,P1
B3FA CB4B     04270          BIT     1,E
B3FC C417B2   04280          CALL    NZ,P6
B3FF DDE1     04290          POP     IX
B401 DD361080 04300          LD      (IX+16),128
B405 DD3613BF 04310          LD      (IX+19),191
B409 DD361180 04320          LD      (IX+17),128
B40D DD3614BF 04330          LD      (IX+20),191
B411 CD53B2   04340          CALL    EA
B414 DDE1     04350          POP     IX
B416 DD361280 04360          LD      (IX+18),128
B41A DD3615BF 04370          LD      (IX+21),191
B41E CB43     04380          BIT     0,E
B420 C4D9B2   04390          CALL    NZ,P0
B423 CB4B     04400          BIT     1,E
B425 C470B1   04410          CALL    NZ,P5
B428 DDE1     04420          POP     IX
B42A DD361380 04430          LD      (IX+19),128
B42E 01E803   04440          LD      BC,1000
B431 CD94B3   04450          CALL    DLY
B434 DD361480 04460          LD      (IX+20),128
B438 01E803   04470          LD      BC,1000
B43B CD94B3   04480          CALL    DLY
B43E DD361580 04490          LD      (IX+21),128
B442 DDE1     04500          POP     IX
B444 C356B5   04510          JP      EHIT
              04513 ;
              04516 ;        THE OTHER HIT ROUTINE
              04519 ;
B447 DDE1     04520 HIT1     POP     IX
B449 DDE5     04530          PUSH    IX
B44B DD364A80 04540          LD      (IX+74),128
B44F CD53B2   04550          CALL    EA
B452 DDE1     04560          POP     IX
B454 DD364B80 04570          LD      (IX+75),128
B458 CB43     04580          BIT     0,E
B45A C406B3   04590          CALL    NZ,P3
B45D CB4B     04600          BIT     1,E
B45F C435B2   04610          CALL    NZ,P8
B462 DDE1     04620          POP     IX
B464 DD364C80 04630          LD      (IX+76),128
B468 CD53B2   04640          CALL    EA
B46B DDE1     04650          POP     IX
B46D DD3650BF 04660          LD      (IX+80),191
B471 CB43     04670          BIT     0,E
B473 C4F7B2   04680          CALL    NZ,P2
B476 CB4B     04690          BIT     1,E
B478 C426B2   04700          CALL    NZ,P7
B47B DDE1     04710          POP     IX
B47D DD3651BF 04720          LD      (IX+81),191
B481 CD53B2   04730          CALL    EA
B484 DDE1     04740          POP     IX
B486 DD3652BF 04750          LD      (IX+82),191
B48A CB43     04760          BIT     0,E
B48C C4E8B2   04770          CALL    NZ,P1
B48F CB4B     04780          BIT     1,E
B491 C417B2   04790          CALL    NZ,P6
B494 DDE1     04800          POP     IX
B496 DD365080 04810          LD      (IX+80),128
B49A DD3653BF 04820          LD      (IX+83),191
B49E DD365180 04830          LD      (IX+81),128
B4A2 DD3654BF 04840          LD      (IX+84),191
B4A6 CD53B2   04850          CALL    EA
B4A9 DDE1     04860          POP     IX
B4AB DD365280 04870          LD      (IX+82),128
B4AF DD3655BF 04880          LD      (IX+85),191
B4B3 CB43     04890          BIT     0,E
B4B5 C4D9B2   04900          CALL    NZ,P0
B4B8 CB4B     04910          BIT     1,E
B4BA C470B1   04920          CALL    NZ,P5
B4BD DDE1     04930          POP     IX
B4BF DD365380 04940          LD      (IX+83),128
B4C3 01E803   04950          LD      BC,1000
B4C6 CD94B3   04960          CALL    DLY
B4C9 DD365480 04970          LD      (IX+84),128
B4CD 01E803   04980          LD      BC,1000
B4D0 CD94B3   04990          CALL    DLY
B4D3 DD365580 05000          LD      (IX+85),128
B4D7 DDE1     05010          POP     IX
B4D9 C356B5   05020          JP      EHIT
              05023 ;
              05026 ;        INCREASE SCORE
              05029 ;
B4DC 21ABB7   05030 ISCORE   LD      HL,0B7ABH
B4DF 7E       05040          LD      A,(HL)
B4E0 3C       05050          INC     A
B4E1 77       05060          LD      (HL),A
B4E2 FE0A     05070          CP      10
B4E4 2802     05080          JR      Z,AS
B4E6 1806     05090          JR      PSC
B4E8 3600     05100 AS       LD      (HL),0
B4EA 2B       05110          DEC     HL
B4EB 7E       05120          LD      A,(HL)
B4EC 3C       05130          INC     A                ;INCREASE 10'S
B4ED 77       05140          LD      (HL),A
              05143 ;
              05146 ;        PRINT SCORE ON SCREEN
              05149 ;
B4EE 3AAAB7   05160 PSC      LD      A,(SCORE)
B4F1 C630     05170          ADD     A,30H
B4F3 112C3E   05180          LD      DE,15916
B4F6 12       05190          LD      (DE),A
B4F7 3AABB7   05210          LD      A,(SCORE+1)
B4FA C630     05220          ADD     A,30H
B4FC 13       05230          INC     DE
B4FD 12       05240          LD      (DE),A
B4FE C9       05250          RET
B4FF 2AADB7   05260 NB       LD      HL,(TG) ;CHECK FOR GAME OVER
B502 2B       05270          DEC     HL
B503 22ADB7   05280          LD      (TG),HL
B506 7C       05290          LD      A,H
B507 B5       05300          OR      L
B508 CA68B5   05310          JP      Z,FIN
B50B 3AACB7   05320          LD      A,(TB)  ;CHECK FOR NEW BLOCK
B50E 3C       05330          INC     A
B50F 32ACB7   05340          LD      (TB),A
B512 FE14     05350          CP      20
B514 C0       05360          RET     NZ
B515 3E00     05370          LD      A,0
B517 32ACB7   05380          LD      (TB),A
B51A 2AA8B7   05390          LD      HL,(RND)
B51D CD43B5   05400          CALL    MULT
B520 DD360080 05410          LD      (IX),128
B524 DD360180 05420          LD      (IX+1),128
B528 DD360280 05430          LD      (IX+2),128
B52C 2AA8B7   05440 NBLOCK   LD      HL,(RND)
B52F 23       05450          INC     HL
B530 22A8B7   05460          LD      (RND),HL                 ;NEW BLOCK
B533 CD43B5   05470          CALL    MULT
B536 DD3600BF 05480          LD      (IX),191
B53A DD3601BF 05490          LD      (IX+1),191
B53E DD3602BF 05500          LD      (IX+2),191
B542 C9       05510          RET
B543 7E       05520 MULT     LD      A,(HL)
B544 47       05530          LD      B,A
B545 114000   05540          LD      DE,64
B548 210000   05550          LD      HL,0
B54B 19       05560 LP7      ADD     HL,DE
B54C 10FD     05570          DJNZ    LP7
B54E 110E3C   05580          LD      DE,15374
B551 19       05590          ADD     HL,DE
B552 E5       05600          PUSH    HL
B553 DDE1     05610          POP     IX
B555 C9       05620          RET
B556 CDDCB4   05630 EHIT     CALL    ISCORE
B559 21ACB7   05640          LD      HL,TB
B55C 3600     05650          LD      (HL),0
B55E DDE5     05660          PUSH    IX
B560 CD2CB5   05670          CALL    NBLOCK
B563 DDE1     05680          POP     IX
B565 C38BB1   05690          JP      MOVE
              05693 ;
              05696 ;        GAME FINISHED
              05699 ;
B568 E1       05700 FIN      POP     HL
B569 01E8FD   05710          LD      BC,65000
B56C CD94B3   05720          CALL    DLY
B56F CDC901   05730          CALL    01C9H
B572 3EBF     05740          LD      A,191
B574 21003C   05750 LP8      LD      HL,15360
B577 11013C   05760          LD      DE,15361
B57A 010004   05770          LD      BC,1024
B57D 77       05780          LD      (HL),A
B57E EDB0     05790          LDIR
B580 3D       05800          DEC     A
B581 FE7F     05810          CP      127
B583 20EF     05820          JR      NZ,LP8
B585 CD3EB0   05830          CALL    BOX
B588 21B6B6   05840          LD      HL,YSCORE
B58B 11173E   05850          LD      DE,15895
B58E CDE0B5   05860          CALL    PA
B591 21AAB7   05870          LD      HL,SCORE
B594 7E       05880          LD      A,(HL)
B595 C630     05890          ADD     A,30H
B597 12       05900          LD      (DE),A
B598 23       05910          INC     HL
B599 7E       05920          LD      A,(HL)
B59A C630     05930          ADD     A,30H
B59C 13       05940          INC     DE
B59D 12       05950          LD      (DE),A
B59E 13       05960          INC     DE
B59F 3E30     05970          LD      A,30H
B5A1 12       05980          LD      (DE),A
B5A2 21C3B6   05990          LD      HL,PLAYA
B5A5 11903E   06000          LD      DE,16016
B5A8 CDE0B5   06010          CALL    PA
B5AB 210838   06020 LP9      LD      HL,3808H
B5AE 7E       06030          LD      A,(HL)
B5AF CB4F     06040          BIT     1,A
```

Listing 2 continues

IF YOU'RE GOING TO BE PICKY ABOUT AN OPERATING SYSTEM SEE WHICH WAS PICKED BEST.

The readers of 80 Micro were asked to select their favorite operating system for the TRS-80 Model I&III. LDOS, DOSPLUS, TRSDOS, MULTIDOS, WOBOS I and NEWDOS/80 were all on the ballot. They picked NEWDOS/80.

The editors of 80 Micro have also awarded their Hall of Fame Awards. From among every software package on the market, the editors picked only six that they felt made a lasting and significant contribution to the TRS-80 computer. NEWDOS/80 was one of the six.

Since we first introduced the NEWDOS operating system we've been stating its features, capabilities and advantages. Thank you 80 Micro readers and NEWDOS/80 users for supporting us.

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Listing 2 continued

```
B5B1 C2BFB5   06050          JP      NZ,STARTA
B5B4 210238   06060          LD      HL,3802H
B5B7 7E       06070          LD      A,(HL)
B5B8 CB77     06080          BIT     6,A
B5BA C2BFB5   06090          JP      NZ,STARTA
B5BD 18EC     06100          JR      LP9
B5BF DD21AAB7 06110 STARTA   LD      IX,SCORE
B5C3 DD360000 06120          LD      (IX),0
B5C7 DD360100 06130          LD      (IX+1),0
B5CB DD360213 06140          LD      (IX+2),19
B5CF DD360350 06150          LD      (IX+3),80
B5D3 DD360402 06160          LD      (IX+4),2
B5D7 01E8FD   06170          LD      BC,65000
B5DA CD94B3   06180          CALL    DLY
B5DD C3AFB0   06190          JP      START
B5E0 7E       06200 PA       LD      A,(HL)
B5E1 FE00     06210          CP      0
B5E3 C8       06220          RET     Z
B5E4 12       06230          LD      (DE),A
B5E5 23       06240          INC     HL
B5E6 13       06250          INC     DE
B5E7 18F7     06260          JR      PA
B5E9 7E       06270 PB       LD      A,(HL)
B5EA FE00     06280          CP      0
B5EC C8       06290          RET     Z
B5ED DD7700   06300          LD      (IX),A
B5F0 23       06310          INC     HL
B5F1 DD23     06320          INC     IX
B5F3 18F4     06330          JR      PB
B5F5 42       06340 INSTR    DEFM    'B O X E R'
     20 4F 20 58 20 45 20 52
B5FE 00       06350          DEFB    0
B5FF 55       06360 INSTR1   DEFM    'USE THE '
     53 45 20 54 48 45 20
B607 5B       06370          DEFB    91
B608 20       06380          DEFM    ' ARROW TO MOVE UP'
     41 52 52 4F 57 20 54 4F
     20 4D 4F 56 45 20 55 50
B619 00       06390          DEFB    0
B61A 55       06400 INSTR2   DEFM    'USE THE '
     53 45 20 54 48 45 20
B622 5C       06410          DEFB    92
B623 20       06420          DEFM    ' ARROW TO MOVE DOWN'
     41 52 52 4F 57 20 54 4F
     20 4D 4F 56 45 20 44 4F
     57 4E
B636 00       06430          DEFB    0
B637 55       06440 INSTR3   DEFM    'USE THE '
     53 45 20 54 48 45 20
B63F 5D       06450          DEFB    93
B640 20       06460          DEFM    ' ARROW TO SWING WITH THE RIGHT HAND'
     41 52 52 4F 57 20 54 4F
     20 53 57 49 4E 47 20 57
     49 54 48 20 54 48 45 20
     52 49 47 48 54 20 48 41
     4E 44
B663 00       06470          DEFB    0
B664 55       06480 INSTR4   DEFM    'USE THE '
     53 45 20 54 48 45 20
B66C 5E       06490          DEFB    94
B66D 20       06500          DEFM    ' ARROW TO SWING WITH THE LEFT HAND'
     41 52 52 4F 57 20 54 4F
     20 53 57 49 4E 47 20 57
     49 54 48 20 54 48 45 20
     4C 45 46 54 20 48 41 4E
     44
B68F 00       06510          DEFB    0
B690 50       06520 PRESS    DEFM    'PRESS <ENTER> TO START'
     52 45 53 53 20 3C 45 4E
     54 45 52 3E 20 54 4F 20
     53 54 41 52 54
B6A6 00       06530          DEFB    0
B6A7 3C       06540 ENTER    DEFM    '<ENTER>'
     45 4E 54 45 52 3E
B6AE 00       06550          DEFB    0
B6AF 53       06560 SC       DEFM    'SCORE:'
     43 4F 52 45 3A
B6B5 00       06570          DEFB    0
B6B6 59       06580 YSCORE   DEFM    'YOUR SCORE :'
     4F 55 52 20 53 43 4F 52
     45 20 3A
B6C2 00       06590          DEFB    0
B6C3 44       06600 PLAYA    DEFM    'DO YOU WISH TO PLAY AGAIN (Y/N)
     4F 20 59 4F 55 20 57 49
     53 48 20 54 4F 20 50 4C
     41 59 20 41 47 41 49 4E
     20 28 59 2F 4E 29
B6E2 00       06610          DEFB    0
B6E3 80       06620 ARM0     DEFB    128
B6E4 B0       06630          DEFB    176
B6E5 B0       06640          DEFB    176
B6E6 B8       06650          DEFB    184
B6E7 BC       06660          DEFB    188
B6E8 B4       06670          DEFB    180
B6E9 00       06680          DEFB    0
B6EA 9E       06690          DEFB    158
B6EB A7       06700          DEFB    167
B6EC 80       06710          DEFB    128
B6ED 82       06720          DEFB    130
B6EE 83       06730          DEFB    131
B6EF 81       06740          DEFB    129
B6F0 00       06750          DEFB    0
B6F1 80       06760 ARM1     DEFB    128
B6F2 80       06770          DEFB    128
B6F3 80       06780          DEFB    128
B6F4 80       06790          DEFB    128
B6F5 A0       06800          DEFB    160
B6F6 B0       06810          DEFB    176
B6F7 90       06820          DEFB    144
B6F8 00       06830          DEFB    0
B6F9 9E       06840          DEFB    158
B6FA AF       06850          DEFB    175
B6FB 83       06860          DEFB    131
B6FC 83       06870          DEFB    131
B6FD 8B       06880          DEFB    139
B6FE 8F       06890          DEFB    143
B6FF 87       06900          DEFB    135
B700 00       06910          DEFB    0
B701 80       06920 ARM2     DEFB    128
B702 80       06930          DEFB    128
B703 80       06940          DEFB    128
B704 80       06950          DEFB    128
B705 80       06960          DEFB    128
B706 A0       06970          DEFB    160
B707 B0       06980          DEFB    176
B708 90       06990          DEFB    144
B709 00       07000          DEFB    0
B70A 9E       07010          DEFB    158
B70B AF       07020          DEFB    175
B70C 83       07030          DEFB    131
B70D 83       07040          DEFB    131
B70E 83       07050          DEFB    131
B70F 8B       07060          DEFB    139
B710 8F       07070          DEFB    143
B711 87       07080          DEFB    135
B712 00       07090          DEFB    0
B713 80       07100 ARM3     DEFB    128
B714 80       07110          DEFB    128
B715 80       07120          DEFB    128
B716 80       07130          DEFB    128
B717 80       07140          DEFB    128
B718 80       07150          DEFB    128
B719 A0       07160          DEFB    160
B71A B0       07170          DEFB    176
B71B 90       07180          DEFB    144
B71C 00       07190          DEFB    0
B71D 9C       07200          DEFB    156
B71E AF       07210          DEFB    175
B71F 83       07220          DEFB    131
B720 83       07230          DEFB    131
B721 83       07240          DEFB    131
B722 83       07250          DEFB    131
B723 8B       07260          DEFB    139
B724 8F       07270          DEFB    143
B725 87       07280          DEFB    135
B726 00       07290          DEFB    0
B727 80       07300 ARM4     DEFB    128
B728 80       07310          DEFB    128
B729 80       07320          DEFB    128
B72A 80       07330          DEFB    128
B72B 80       07340          DEFB    128
B72C 80       07350          DEFB    128
B72D 80       07360          DEFB    128
B72E A0       07370          DEFB    160
B72F B0       07380          DEFB    176
B730 90       07390          DEFB    144
B731 00       07400          DEFB    0
B732 9C       07410          DEFB    156
B733 AF       07420          DEFB    175
B734 83       07430          DEFB    131
B735 83       07440          DEFB    131
B736 83       07450          DEFB    131
B737 83       07460          DEFB    131
B738 83       07470          DEFB    131
B739 8B       07480          DEFB    139
B73A 8F       07490          DEFB    143
B73B 87       07500          DEFB    135
B73C 00       07510          DEFB    0
B73D AD       07520 ARM5     DEFB    173
B73E B6       07530          DEFB    182
B73F 80       07540          DEFB    128
B740 A0       07550          DEFB    160
B741 B0       07560          DEFB    176
B742 90       07570          DEFB    144
B743 00       07580          DEFB    0
B744 80       07590          DEFB    128
B745 83       07600          DEFB    131
B746 83       07610          DEFB    131
B747 8B       07620          DEFB    139
B748 8F       07630          DEFB    143
B749 87       07640          DEFB    135
B74A 00       07650          DEFB    0
B74B AD       07660 ARM6     DEFB    173
B74C BE       07670          DEFB    190
B74D B0       07680          DEFB    176
B74E B0       07690          DEFB    176
B74F B8       07700          DEFB    184
B750 BC       07710          DEFB    188
B751 B4       07720          DEFB    180
B752 00       07730          DEFB    0
B753 80       07740          DEFB    128
```

Listing 2 continues

Listing 2 continued

```
B754 80        07750          DEFB    128
B755 80        07760          DEFB    128
B756 80        07770          DEFB    128
B757 82        07780          DEFB    130
B758 83        07790          DEFB    131
B759 81        07800          DEFB    129
B75A 00        07810          DEFB    0
B75B AD        07820 ARM7     DEFB    173
B75C BE        07830          DEFB    190
B75D B0        07840          DEFB    176
B75E B0        07850          DEFB    176
B75F B0        07860          DEFB    176
B760 B8        07870          DEFB    184
B761 BC        07880          DEFB    188
B762 B4        07890          DEFB    180
B763 00        07900          DEFB    0
B764 80        07910          DEFB    128
B765 80        07920          DEFB    128
B766 80        07930          DEFB    128
B767 80        07940          DEFB    128
B768 80        07950          DEFB    128
B769 82        07960          DEFB    130
B76A 83        07970          DEFB    131
B76B 81        07980          DEFB    129
B76C 00        07990          DEFB    0
B76D 8D        08000 ARM8     DEFB    141
B76E BE        08010          DEFB    190
B76F B0        08020          DEFB    176
B770 B0        08030          DEFB    176
B771 B0        08040          DEFB    176
B772 B0        08050          DEFB    176
B773 B8        08060          DEFB    184
B774 BC        08070          DEFB    188
B775 B4        08080          DEFB    180
B776 00        08090          DEFB    0
B777 80        08100          DEFB    128
B778 80        08110          DEFB    128
B779 80        08120          DEFB    128
B77A 80        08130          DEFB    128
B77B 80        08140          DEFB    128
B77C 80        08150          DEFB    128
B77D 82        08160          DEFB    130
B77E 83        08170          DEFB    131
B77F 81        08180          DEFB    129
B780 00        08190          DEFB    0
B781 8D        08200 ARM9     DEFB    141
B782 BE        08210          DEFB    190
B783 B0        08220          DEFB    176
B784 B0        08230          DEFB    176
B785 B0        08240          DEFB    176
B786 B0        08250          DEFB    176
B787 B0        08260          DEFB    176
B788 B8        08270          DEFB    184
B789 BC        08280          DEFB    188
B78A B4        08290          DEFB    180
B78B 00        08300          DEFB    0
B78C 80        08310          DEFB    128
B78D 80        08320          DEFB    128
B78E 80        08330          DEFB    128
B78F 80        08340          DEFB    128
B790 80        08350          DEFB    128
B791 80        08360          DEFB    128
B792 80        08370          DEFB    128
B793 82        08380          DEFB    130
B794 83        08390          DEFB    131
B795 81        08400          DEFB    129
B796 00        08410          DEFB    0
B797 AA        08420 HEAD     DEFB    170
B798 80        08430          DEFB    128
B799 91        08440          DEFB    145
B79A 9D        08450          DEFB    157
B79B 84        08460          DEFB    132
B79C 00        08470          DEFB    0
B79D 80        08480 BLANK    DEFB    128
B79E 80        08490          DEFB    128
B79F 80        08500          DEFB    128
B7A0 80        08510          DEFB    128
B7A1 80        08520          DEFB    128
B7A2 80        08530          DEFB    128
B7A3 80        08540          DEFB    128
B7A4 80        08550          DEFB    128
B7A5 80        08560          DEFB    128
B7A6 80        08570          DEFB    128
B7A7 00        08580          DEFB    0
B7A8 00        08590 RND      DEFB    0
B7A9 A0        08600          DEFB    0A0H
B7AA 00        08610 SCORE    DEFB    0
B7AB 00        08620          DEFB    0
B7AC 13        08630 TB       DEFB    19
B7AD 50        08640 TG       DEFB    80
B7AE 02        08650          DEFB    2
B000           08660          END     0B000H
```

```
10 FORX=-24576TO-20479:POKEX,RND(14):NEXT
```

Program Listing 3

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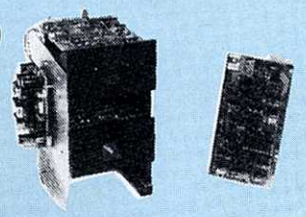

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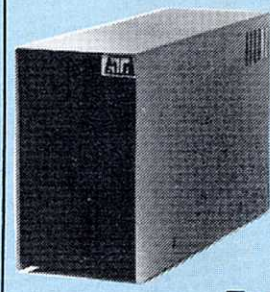

Add-on disk drives for the Model I and III are available in 40 and 80 track, single and double head configurations. Contact MTI or a local authorized dealer.

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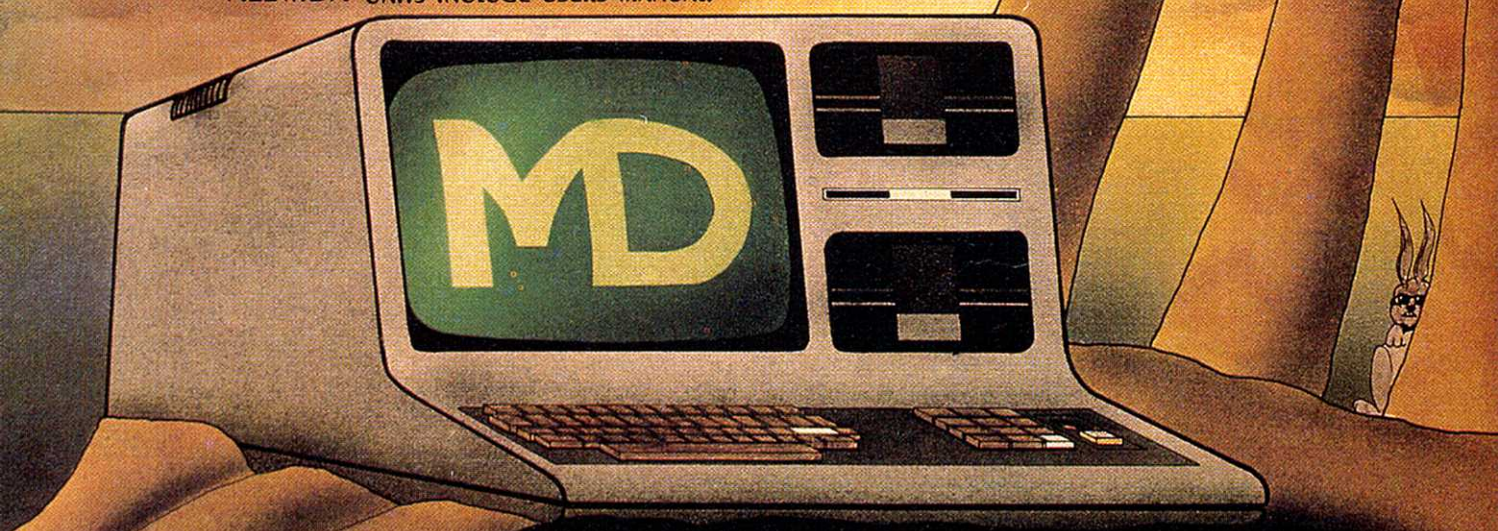

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Foreign Flag Quiz

by Jennifer Neidenbach
Third Place
11–13

This program prints the flags of 10 different countries. The player tries to guess the country to which the printed flag belongs. If the answer is correct, the program continues with the next flag. If the player guesses incorrectly, the program gives the correct answer.

Line Functions

Lines 5–10 hold remark statements. Lines 15–75 are instructions.

Line 80 begins the quiz. Lines 85–100 hold flag 1, Poland. Lines 110–135 hold flag 2, Switzerland. Lines 145–185 hold flag 3, Greece. Lines 190–255 hold flag 4, Jamaica. Lines 260–275 hold flag 5, Thailand. Lines 280–300 hold flag 6, Japan. Lines 305–415 hold flag 7, Great Britain. Lines 420–455 hold flag 8, Czechoslovakia. Lines 480–515 hold flag 10, Kuwait.

Line 9999 directs the program to the goodbye routine. Lines 10000–10020 hold a subroutine to outline the flag and print question.

Lines 11000–11105 hold a subroutine to ask question and check the player's answer. Lines 11200–11240 hold the goodbye routine, and Line 11245 is the end. ■

The Key Box

Model I or III
16K, 32K RAM
Cassette or Disk Basic

Jennifer Neidenbach (age 13) can be reached at 3057 Shawnee Lane, Drayton Plains, MI 48020.

Program Listing

```
5 'FOREIGN FLAG QUIZ
10 'INTRODUCTION
15 CLS:PRINT:PRINT:PRINT:PRINT
20 PRINTTAB(20)"FOREIGN FLAG QUIZ"
25 PRINTTAB(14)"WRITTEN BY JENNIFER NEIDENBACH"
30 PRINT:PRINT:PRINT:PRINTTAB(14)"PRESS <ENTER> FOR INSTRUCTIONS
";:INPUT Z
35 CLS
40 'INSTRUCTIONS
45 CLS
50 PRINTTAB(13)"   THIS IS THE   'FOREIGN FLAG QUIZ'."
55 PRINTTAB(12)" I WILL PRINT THE FLAGS OF TEN DIFFERENT"
60 PRINTTAB(12)" COUNTRIES, AND YOU TYPE IN THE COUNTRY"
65 PRINTTAB(13)"THAT FLAG BELONGS TO.":PRINT
70 PRINTTAB(13)"   PRESS ANY KEY TO BEGIN."
75 I$=INKEY$:IF I$="" THEN GOTO 75
80 'BEGINNING OF QUIZ
85 'FLAG ONE -- POLAND
90 CLS:GOSUB 10000
95 FOR I=14 TO 49:PRINT@I+320,CHR$(191);:PRINT@I+384,CHR$(191);:
PRINT@I+448,CHR$(191);:NEXT I
100 C$="POLAND":GOSUB 11000
110 'FLAG TWO -- SWITZERLAND
115 CLS:PRINT@653,"WHAT COUNTRY DOES THIS FLAG BELONG TO?"
120 FOR I=14 TO 49:PRINT@I+128,CHR$(191);:PRINT@I+192,CHR$(191);
:PRINT@I+256,CHR$(191);:PRINT@I+320,CHR$(191);:PRINT@I+384,CHR$(
191);:PRINT@448+I,CHR$(19);:NEXT I
125 FOR I=52 TO 69:RESET(I,13):RESET(I,14):RESET(I,15):NEXT I
130 FOR I=58 TO 63:RESET(I,10):RESET(I,11):RESET(I,12):RESET(I,1
6):RESET(I,17):RESET(I,18):NEXT I
135 C$="SWITZERLAND":GOSUB 11000
145 'FLAG THREE -- GREECE
150 CLS:GOSUB 10000
155 FOR I=15 TO 18:PRINT@I+128,CHR$(191);:NEXT I
160 FOR I=21 TO 24:PRINT@I+128,CHR$(191);:NEXT I
165 FOR I=30 TO 37:SET(I,9):SET(I,12):SET(I,13):SET(I,14):SET(I,
15):NEXT I
170 FOR I=42 TO 49:SET(I,9):SET(I,12):SET(I,13):SET(I,14):SET(I,
15):NEXT I
175 FOR I=50 TO 97:SET(I,7):SET(I,10):SET(I,11):SET(I,14):SET(I,
15):NEXT I
180 FOR I=30 TO 97:SET(I,18):SET(I,19):SET(I,22):NEXT I
185 C$="GREECE":GOSUB 11000
190 'FLAG FOUR -- JAMAICA
191 CLS:GOSUB 10000
192 PRINT@147,CHR$(140);:PRINT@148,CHR$(140);:PRINT@170,CHR$(140
);:PRINT@171,CHR$(140);:PRINT@149,CHR$(176);:PRINT@150,CHR$(176)
;:PRINT@168,CHR$(176);:PRINT@169,CHR$(176);
193 PRINT@230,CHR$(131);:PRINT@231,CHR$(131);:PRINT@217,CHR$(140
);:PRINT@218,CHR$(140);:PRINT@228,CHR$(140);:PRINT@229,CHR$(140)
;
194 PRINT@215,CHR$(131);:PRINT@216,CHR$(131);:PRINT@209,CHR$(176
);
195 PRINT@219,CHR$(176);:PRINT@220,CHR$(176);:PRINT@227,CHR$(176
);:PRINT@226,CHR$(176);:PRINT@285,CHR$(131);:PRINT@286,CHR$(131)
;:PRINT@287,CHR$(140);:PRINT@288,CHR$(140);:PRINT@289,CHR$(131);
```

Listing continues

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Listing continued

```
197 FOR I=31 TO 33:PRINT@I+320,CHR$(176);:NEXT I
200 PRINT@413,CHR$(131);:PRINT@414,CHR$(131);:PRINT@418,CHR$(131
);:PRINT@419,CHR$(131);:PRINT@431,CHR$(140);:PRINT@432,CHR$(140)
;
203 PRINT@218,CHR$(176);:PRINT@219,CHR$(140);:PRINT@409,CHR$(176
);:PRINT@410,CHR$(176);:PRINT@422,CHR$(176);:PRINT@423,CHR$(176)
;
206 PRINT@471,CHR$(131);:PRINT@472,CHR$(131);:PRINT@488,CHR$(131
);:PRINT@489,CHR$(131);:PRINT@469,CHR$(140);:PRINT@470,CHR$(140)
;
209 PRINT@491,CHR$(140);:PRINT@411,CHR$(140);:PRINT@412,CHR$(140
);:PRINT@490,CHR$(140);:PRINT@420,CHR$(140);:PRINT@421,CHR$(140)
;
212 FOR I=15 TO 20:PRINT@256+I,CHR$(191);:PRINT@320+I,CHR$(191);
:NEXTI
214 FOR I=15 TO 17:PRINT@I+384,CHR$(191);:NEXT I
216 FOR I=21 TO 23:PRINT@I+320,CHR$(191);:NEXT I
218 PRINT@402,CHR$(143);:PRINT@403,CHR$(143);:PRINT@463,CHR$(131
);:PRINT@404,CHR$(131);:PRINT@405,CHR$(131);:PRINT@207,CHR$(188)
;:PRINT@208,CHR$(188);:PRINT@210,CHR$(176);
220 PRINT@277,CHR$(188);:PRINT@278,CHR$(188);:PRINT@279,CHR$(176
);:PRINT@280,CHR$(176);:PRINT@344,CHR$(143);:PRINT@345,CHR$(143)
;
225 FOR I=41 TO 48:PRINT@256+I,CHR$(191);:PRINT@320+I,CHR$(191);
:NEXTI
230 FOR I=37 TO 38:PRINT@256+I,CHR$(176);:PRINT@320+I,CHR$(131);
:NEXTI
235 FOR I=39 TO 40:PRINT@256+I,CHR$(188);:PRINT@320+I,CHR$(143);
:NEXTI
240 FOR I=43 TO 44:PRINT@I+192,CHR$(176);:PRINT@384+I,CHR$(131);
:NEXTI
245 FOR I=45 TO 46:PRINT@192+I,CHR$(188);:PRINT@384+I,CHR$(143);
:NEXT I
247 PRINT@218,CHR$(140);:PRINT@219,CHR$(176);
250 FOR I=47 TO 48:PRINT@192+I,CHR$(191);:PRINT@384+I,CHR$(191);
:NEXT I
251 GOSUB 10000
255 C$="JAMAICA":GOSUB 11000
260 'FLAG FIVE -- THAILAND
265 CLS:GOSUB 10000
270 FOR I=14 TO 49:PRINT@128+I,CHR$(191);:PRINT@256+I,CHR$(191);
:PRINT@320+I,CHR$(191);:PRINT@448+I,CHR$(191);:NEXT I
275 C$="THAILAND":GOSUB 11000
280 'FLAG SIX -- JAPAN
285 CLS:GOSUB 10000
290 FOR I=30 TO 33:PRINT@I+256,CHR$(191);:PRINT@I+320,CHR$(191);
:NEXT I
295 PRINT@284,CHR$(160);:PRINT@348,CHR$(130);:PRINT@285,CHR$(188
);:PRINT@349,CHR$(143);:PRINT@290,CHR$(188);:PRINT@354,CHR$(143)
;:PRINT@291,CHR$(144);:PRINT@355,CHR$(129);
300 C$="JAPAN":GOSUB 11000
305 'FLAG SEVEN -- GREAT BRITAIN
310 CLS:GOSUB 10000
315 FOR I=15 TO 49:PRINT@128+I,CHR$(191);:PRINT@192+I,CHR$(191);
:PRINT@I+256,CHR$(191);:PRINT@I+320,CHR$(191);:PRINT@384+I,CHR$(
191);:PRINT@448+I,CHR$(191);:NEXT I
320 FOR I=30 TO 61:RESET(I,13):RESET(I,15):NEXT I:FOR I=66 TO 97
:RESET(I,13):RESET(I,15):NEXT I
325 FOR I=7 TO 12:RESET(60,I):RESET(61,I):RESET(67,I):RESET(66,I
):NEXT I
327 FOR I=16 TO 22:RESET(60,I):RESET(61,I):RESET(66,I):RESET(67,
I):NEXT I
330 FOR I=34 TO 39:RESET(I,7):NEXT I:FOR I=38 TO 44:RESET(I,8):N
EXT I:FOR I=30 TO 33:RESET(I,8):NEXT I:FOR I=33 TO 37:RESET(I,9)
:NEXT I:FOR I=44 TO 51:RESET(I,9):NEXT I
335 FOR I=37 TO 43:RESET(I,10):NEXT I:FOR I=50 TO 57:RESET(I,10)
:NEXT I:FOR I=43 TO 49:RESET(I,11):NEXT I:FOR I=46 TO 48:RESET(I
,11):NEXT I
340 RESET(70,11):RESET(71,11):FOR I=71 TO 77:RESET(I,10):NEXT I:
FOR I=78 TO 84:RESET(I,11):NEXT I:FOR I=84 TO 90:RESET(I,10):NEX
T I:FOR I=77 TO 83:RESET(I,9):NEXT I
345 FOR I=90 TO 96:RESET(I,9):NEXT I:FOR I=83 TO 89:RESET(I,8):N
EXT I:RESET(96,8):RESET(97,8):FOR I=89 TO 93:RESET(I,7):NEXT I
347 FOR I=66 TO 67:RESET(I,12):RESET(I,17):NEXT I
350 FOR I=36 TO 40:RESET(I,22):NEXT I:FOR I=30 TO 35:RESET(I,21)
:NEXT I:FOR I=40 TO 44:RESET(I,21):NEXT I:FOR I=35 TO 39:RESET(I
,20):NEXT I
355 FOR I=44 TO 48:RESET(I,20):NEXT I:FOR I=39 TO 43:RESET(I,19)
:NEXT I:FOR I=48 TO 52:RESET(I,19):NEXT I:FOR I=43 TO 47:RESET(I
,18):NEXT I
360 FOR I=52 TO 56:RESET(I,18):NEXT I:FOR I=47 TO 51:RESET(I,17)
:NEXT I:FOR I=56 TO 58:RESET(I,17):NEXT I:RESET(70,17):RESET(71,
17)
365 FOR I=76 TO 80:RESET(I,17):NEXT I:FOR I=71 TO 75:RESET(I,18)
:NEXT I:FOR I=80 TO 84:RESET(I,18):NEXT I:FOR I=75 TO 79:RESET(I
,19):NEXT I
370 FOR I=84 TO 89:RESET(I,19):NEXT I:FOR I=79 TO 83:RESET(I,20)
:NEXT I:FOR I=88 TO 92:RESET(I,20):NEXT I:FOR I=83 TO 87:RESET(I
,21):NEXT I:FOR I=92 TO 95:RESET(I,21):NEXT I
375 FOR I=87 TO 91:RESET(I,22):NEXT I
415 C$="GREAT BRITAIN":GOSUB 11000
420 'FLAG EIGHT -- CZECHOSLOVAKIA
425 CLS:GOSUB 10000
430 FOR I=15 TO 20:PRINT@I+192,CHR$(191);:PRINT@I+384,CHR$(191);
```

Listing continues

Listing continued

```
:NEXT I
435 FOR I=15 TO 26:PRINT@I+256,CHR$(191);:PRINT@I+320,CHR$(191);
:NEXT I
440 PRINT@143,CHR$(191);:PRINT@144,CHR$(191);:PRINT@463,CHR$(191
);:PRINT@464,CHR$(191);:PRINT@465,CHR$(179);:PRINT@466,CHR$(179)
;:PRINT@145,CHR$(179);:PRINT@146,CHR$(179);:PRINT@213,CHR$(188);

445 PRINT@214,CHR$(188);:PRINT@404,CHR$(143);:PRINT@405,CHR$(143
);:PRINT@406,CHR$(131);:PRINT@407,CHR$(131);:PRINT@215,CHR$(176)
;:PRINT@216,CHR$(176);:PRINT@283,CHR$(188);:PRINT@284,CHR$(188);

450 PRINT@347,CHR$(143);:PRINT@348,CHR$(143);:FOR I=58 TO 97:SET
(I,14):SET(I,15):NEXT I
455 C$="CZECHOSLOVAKIA":GOSUB 11000
460 'FLAG NINE -- SOUTH VIETNAM
465 CLS:GOSUB 10000
470 FOR I=30 TO 97:SET(I,12):SET(I,14):SET(I,16):NEXT I
475 C$="SOUTH VIETNAM":GOSUB 11000
480 'FLAG TEN -- KUWAIT
485 CLS:GOSUB 10000
490 FOR I=15 TO 26:PRINT@256+I,CHR$(191);:PRINT@320+I,CHR$(191);
:NEXT I
495 FOR I=15 TO 20:PRINT@192+I,CHR$(191);:PRINT@384+I,CHR$(191);
:NEXT I
500 PRINT@143,CHR$(191);:PRINT@144,CHR$(191);:PRINT@463,CHR$(191
);:PRINT@464,CHR$(191);:PRINT@465,CHR$(179);:PRINT@466,CHR$(179)
;:PRINT@145,CHR$(179);:PRINT@146,CHR$(179);
505 PRINT@213,CHR$(188);:PRINT@214,CHR$(188);:PRINT@215,CHR$(176
);:PRINT@216,CHR$(176);:PRINT@405,CHR$(143);:PRINT@406,CHR$(143)
;:PRINT@407,CHR$(131);:PRINT@408,CHR$(131);
510 FOR I=54 TO 97:SET(I,12):SET(I,17):NEXT I
515 C$="KUWAIT":GOSUB 11000
9999 GOTO 11200
10000 'SUBROUTINE FOR OUTLINE OF FLAG AND PRINTING OF QUESTION
10005 FOR I=28 TO 99:SET(I,6):SET(I,23):NEXT I
10010 FOR I=7 TO 22:SET(28,I):SET(29,I):SET(99,I):SET(98,I):NEXT
 I
10015 PRINT@653,"WHAT COUNTRY DOES THIS FLAG BELONG TO?"
10020 RETURN
11000 'SUBROUTINE FOR ASKING OF QUESTION - CHECKING OF ANSWER
11005 PRINT@702,"":INPUT A$
11010 IF A$=C$ THEN H=H+1:PRINTTAB(13)"THAT IS CORRECT.":GOTO 11
025
11015 PRINTTAB(13)"I AM SORRY; THE CORRECT ANSWER IS ";C$;"."
11025 PRINT:PRINTTAB(13)"PRESS ANY KEY TO CONTINUE"
11100 I$=INKEY$:IF I$="" THEN GOTO 11100
11105 RETURN
11200 'END OF PROGRAM
11203 CLS
11205 FOR I=6 TO 40:SET(46,I):SET(47,I):NEXT I
11210 FOR I=48 TO 87:SET(I,6):SET(I,17):NEXT I
11215 FOR I=7 TO 16:SET(86,I):SET(87,I):NEXT I
11220 FOR I=48 TO 69:SET(I,20):SET(I,24):NEXT I
11225 FOR I=21 TO 23:SET(68,I):SET(69,I):NEXT I
11230 PRINT@473,"GOODBYE!";:PRINT@219,"YOU IDENTIFIED";
11235 PRINT@280,H;"FLAGS CORRECTLY";
11240 PRINT@896,"";
12000 END
```


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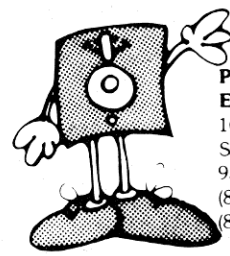

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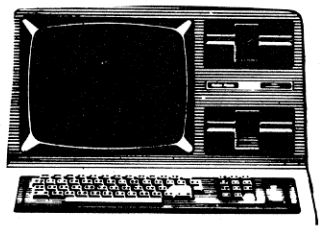

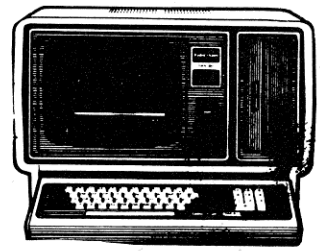

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CASS-80

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Program Listing

```
0 CLEAR2400:DIMSM(60),DM(60),SD(60),MM(60),MG$(16),CH$(14),UL$(6
0),MT$(60),DT$(60):HP=-29000:DP=-16000
1 ON ERROR GOTO 62000
3 INPUT"DATE : (MM/DD/YR DAY)";DE$:INPUT"CALLER #";A:INPUT"THIS
WEEKS QUIZ QUESTION";Q1$
5 DU$=INKEY$:IF INP(232)<32 THEN7ELSE POKE-186,0:GOTO5
7 NK=1:TF=0:GOSUB11000:GOSUB29000:UL=UL+1:UL$(UL)=NM$
8 GOSUB18995:GOSUB 24900
9 GOSUB 14000
10 PRINT"Welcome to Cass-80 Version 1.6":PRINT"(C).1982 - Scott
Steele":FOR DU=1TO 500:NEXT DU
30 IFBU>0THENGOSUB34:PRINT:PRINT"BULLETINS:":PRINT:FORED=1TOBU:P
RINT"("ED")."BU$(ED):NEXT
33 GOTO40
34 PRINT"CARE TO SEE THE BULLETINS?";
35 A$=INKEY$:IF A$=""THEN35ELSEIFA$="Y"ORASC(A$)=97THENPRINT"Yes
":GOTO40ELSEIFA$="N"ORASC(A$)=110THENPRINT"No":RETURNELSE35
57 PRINT"The date is------>>>>>>"DE$"<<<<<<------":PRINT:PRINT"Y
ou are caller";:A=A+1:GOSUB29400:PRINTA:IFBD=2THENPRINT"You are
in the MAIN board."ELSEPRINT"You are in the D&D board."
58 PRINT"Want to skip menu (Y/N)?";
59 DU$=INKEY$:IF INP(232)>32 THEN 5 ELSE IF DU$=""THEN59ELSEIF D
U$="Y"ORASC(DU$)=121THEN PRINT"Yes":PRINT:PRINT:PRINT:PRINT:PRIN
T:PRINT:PRINT:GOTO 65 ELSE IF DU$="N"OR ASC(DU$)=110THEN PRINT"N
o":GOTO60 ELSE 59
60 PRINT"-->> Cass-80 Commands <<--":PRINT"(A)...Ads":PRINT"(B).
..Bell (On/Off)":PRINT"(C)...Chat":PRINT"(G)...Goodbye":PRINT"(I
)...System info":PRINT"(L)...Line feeds(On/Off)"
61 PRINT"(N)...Null adjustment":PRINT"(O)...Other systems":PRINT
"(P)...Post":PRINT"(Q)...Quiz question":PRINT"(R)...Read a messa
ge":PRINT"(S)...Scan messages":PRINT"(U)...User log":PRINT"(Y)..
.Any messages for you?":PRINT"(*)...Switches between MAIN and D&
D
62 PRINT"(%)...Quick log-off":PRINT
65 PRINT"Command (A,B,C,G,I,K,M,N,O,P,Q,R,S,U,Y,*,% or ? for com
mands)-->";:ON ERROR GOTO 62000:LN=0:SB$="":F$="":P$="":MG$(1)="
":SM$="":RF=0:PQ$="":PA$=""
67 IFNK=0THEN70ELSEFOR TA=1TO5:PRINTCHR$(7);:NEXT TA
70 A$=INKEY$:IF INP(232)>32 THEN 5 ELSEIF PEEK(14400)=2 THEN 160
00ELSEIF A$="" THEN 70
71 IF ASC(A$)>95 AND ASC(A$)<127 THEN A$=CHR$(ASC(A$)-32)
80 IFA$="A"THENPRINT"Ads":GOTO1000ELSEIFA$="C"THENPRINT"Chat":GO
TO2000ELSEIFA$="G"THENPRINT"Goodbye":GOTO3000ELSEIFA$="O"THENPRI
NT"Other systems":GOTO4000ELSEIFA$="P"THENPRINT"Post a message":
GOTO5000ELSEIFA$="Q"THENPRINT"Quiz questions":GOTO 6000
81 IFA$="R"THENPRINT"Read a message":GOTO6999ELSEIFA$="S"THENPRI
NT"Scan messages":GOTO 8000ELSEIFA$="L"THENGOTO 10000
82 IF A$="?"THENPRINT:GOTO60ELSEIF A$="N"THENPRINT"Null adjustme
nt":GOTO31000ELSEIF A$="*"THENPRINT"Board change":GOTO45500ELSEI
FA$="I"THEN18600
83 IF A$="%"THEN3090ELSEIFA$="U"THENPRINT:PRINT"Userlog":PRINT:G
OTO26000ELSEIFA$="B"THENPRINT:PRINT"Bell adjustment":PRINT:GOTO2
8000ELSEIFA$="Y"THEN29100ELSE70
```

Listing continues

Adding a modem to my Model I, Level II TRS-80 expanded my use of the computer by allowing me to call various bulletin board systems. By locating boards locally and in other parts of the country I made a host of new aquaintances and friends.

I thought it would be great if I had my own bulletin board so people could call *me* from other areas of the country. So, I began to contact different system operators for advice on how I might put my own board together. Unfortunately, the consensus of opinion was that without at least one disk drive, a bulletin board system would be impossible. It looked as though my dream of becoming a system operator would have to be put aside until I could buy a disk system.

The prospects of this happening were pretty dim, and I was not content to be just a user of other peoples' bulletin boards.

I decided to tackle the "impossible" and write my own program for a cassette bulletin board system. I had only 48K of memory to hold the program and the messages, but nothing to lose by trying.

My original program stored the messages in arrays, which worked out okay until I found things that I wanted to change. If the changes required editing

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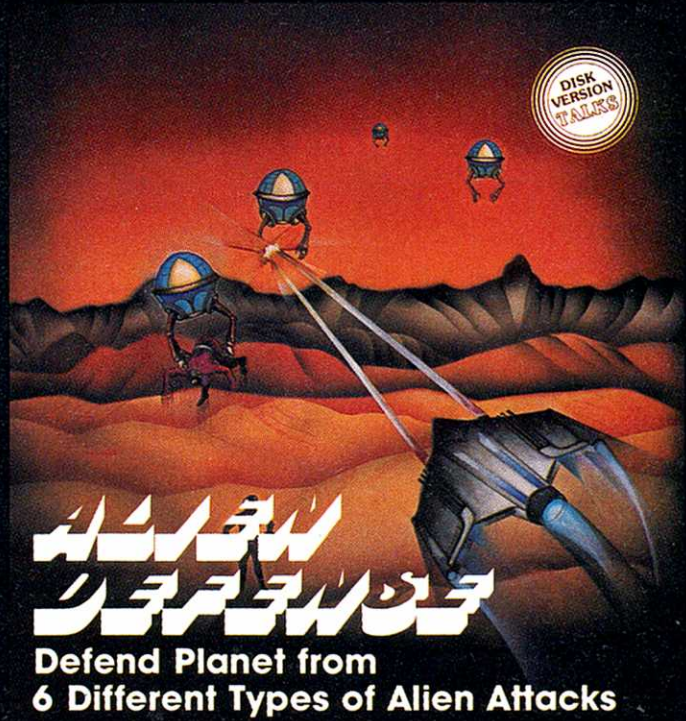

ALIEN DEFENSE

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Listing continued

```
1000 PRINT"If you would like to leave an ad, leave me a comment
when you leave and I'll post it...It's $1 and it stays up at lea
st two      months...":PRINT:IF AD=0 THEN PRINT"Sorry,no ads yet
..." ELSE FOR AC=1 TO AD:PRINTAD$(AC):PRINT:NEXT AC:PRINT"That's
 al
1010 GOTO 65
2000 IFPG=1THENPRINT:PRINT"SYSOP not here now...Try later":PRINT
:GOTO 65ELSECLS:PRINT"Paging SYSOP...'A' will abort...":FORPQ=1T
O5:PRINT"Paging":PRINT#-1,"*":IFPEEK(14400)=2THEN15000ELSEFORAX=
1TO10:IFINKEY$="A"THEN2005ELSENEXTAX:NEXTPQ
2001 PRINT"He's not here now...Recording attempt...":CH=CH+1:IF
CH>15THEN65ELSECH$(CH)=NM$:IF CH$(CH)=CH$(CH-1)THENCH$(CH-1)=CH$
(CH-1)+"2":CH=CH-1:GOTO65ELSE65
2005 PRINT:PRINT"Chat aborted...":PRINT:GOTO 65
3000 CLS:IF CA=1 THEN GOSUB 22000 ELSE PRINT"Goodbye...Want to l
eave a message to the SYSOP (Y,N,A)?";
3001 A$=INKEY$:IF A$=""THEN3001ELSE GOSUB27330:IF A$="A"THEN PRI
NT"Abort":PRINT:GOTO 65 ELSE IF A$="N" THEN PRINT"No":GOTO3090EL
SE IF A$="Y"THEN PRINT"Yes":GOTO3002ELSE3001
3002 IFBD=1THENCF=1:BD=2:GOSUB45501
3003 PRINT"This message will be marked so only the SYSOP may see
 it.":SM(MG+1)=1:RF=1:GOSUB5000:RF=0:CF=0:GOTO3090
3004 LN=LN+1:IF LN>3 THEN LN=LN-1:GOTO 3010 ELSE INPUTSR$(LN):IF
SR$(LN)="" THEN LN=LN-1:GOTO 3010 ELSE 3004
3090 PRINT:PRINT"Goodbye "NM$"...Thanks for calling Cassette 80"
:PRINT"Please call again..."
3095 OUT234,171:OUT234,0:OUT234,165:FORLN=1TO10:NEXTLN:GOTO3095
4000 CLS:PRINT"Other Known Operating Systems:":PRINT"Any updates
 or changes would be appreciated(Leave SYSOP message)":PRINT"NAM
E","NUMBER","HOURS":PRINT"CHIPMUNK","323-3741","24":PRINT"NORTH-
PARK ","745-0924","24":PRINT"ROGERS PARK","973-2227","24"
4001 PRINT"LAMS","740-9128","24",,"GAMEMASTER","475-4884","24",,
"PMS/LINK","870-7176","24":PRINT"VIDEO ADVENTURE","475-5282","9A
M TO 9PM",,"CRT","373-8057","24",,"CODE","537-7063","24",,"PIRAT
ES SHIP","935-2933","24",,"APPLE-NET","685-9573","24",,
4002 PRINT"METRO WEST","260-0640","24",,"NAPY","420-7995","6PM-6
AM(9PM FRI)","PBBS","359-9450","24",,"WARD AND RANDY'S 545-8086"
,"24",,"MESSAGE-82","622-4442","24",,"NESSY","773-3308","24",,"C
AMS","927-1020","24",,"HIT <ENTER> TO RETURN TO MAIN MENU."
4003 DU$=INKEY$:IF DU$=""THEN 4003 ELSE 65
5000 PRINT:PRINT:PRINT"Post messages":PRINT"This will be message
";MG+1;"...":F$=NM$:PRINT"Please enter the subject";:GOSUB 63001
:PRINT
5001 PRINT"Enter your message one line at a time... 15 lines at
63          characters per line...<ENTER> on a new line ends mes
sage.":HL=1:MG=MG+1
5002 PRINTHL")."CHR$(14)
5003 A$=INKEY$:IF A$=""THEN 5003 ELSE PRINTA$;:IF ASC(A$)=13 THE
N 5004 ELSE IF ASC(A$)=8 AND LEN(MG$(HL))>0 THEN MG$(HL)=LEFT$(M
G$(HL),LEN(MG$(HL))-1):GOTO 5003 ELSE IF LEN(MG$(HL))>63THEN PRI
NTCHR$(8);:GOTO 5003 ELSE 5099
5004 IF LEN(MG$(HL))=0 THEN HL=HL-1:GOTO 5005 ELSEIFLEN(MG$(HL))
=1ANDASC(MG$(HL))=10THENHL=HL-1:GOTO5005ELSE IF  HL=15 THEN 5005
 ELSE MG$(HL)=MG$(HL)+CHR$(13):HL=HL+1:MG$(HL)="":GOTO 5002
5005 PRINT:PRINT"A-Abort  C-Continue  E-Edit L-List":PRINT"S-Sav
e":PRINT"Enter choice-->";
5006 A$=INKEY$:IF A$=""THEN 5006 ELSE GOSUB27330:IF A$="A" THEN
5100 ELSE IF A$="C"THEN 5200 ELSE IF A$="E" THEN 5300 ELSE IF A$
="L"THEN 5400 ELSE IF A$="S" THEN5010 ELSE 5006
5010 PRINT"Save message":GOSUB 39800:FOR NR=1TOLEN(SB$):POKEHP,A
SC(MID$(SB$,NR,1)):HP=HP+1:NEXT NR:POKE HP,255:HP=HP+1:GOSUB 397
00:FOR NR=1TOLEN(PW$):POKEHP,ASC(MID$(PW$,NR,1)):HP=HP+1:NEXT NR
:POKE HP,254:HP=HP+1
5011 FOR HM=1TOHL:FOR MP=1TOLEN(MG$(HM)):AV=ASC(MID$(MG$(HM),MP,
1)):POKE HP,AV:HP=HP+1:NEXT MP:NEXT HM:POKE HP,253:HP=HP+1:PRINT
"MESSAGE SAVED":PRINT:IFRF=1THENRETURNELSE65
5060 HM=HM+1:MG$(HM,LN)=MG$(HM,LN)+"END":PRINT"MESSAGE";HM;"SAVE
D.":PRINT:LN=0:GOTO 65
5099 MG$(HL)=MG$(HL)+A$:GOTO 5003
5100 PRINT"Abort":PRINT:PRINT"Are you sure you want to abort thi
s message (Y/N)?"
5101 A$=INKEY$:IF A$=""THEN5101ELSEGOSUB27330:IFA$="Y" THEN MG=M
G-1:PRINT"MESSAGE ABORTED":PRINT:PRINT:GOTO 65 ELSE IF A$="N" TH
EN PRINT:GOTO 5005 ELSE 5101
5200 PRINT"Continue":IFHL=15THENPRINT"All lines filled. Can not
continue":GOTO5005ELSEPRINT:FOR ZV=1TO HL:PRINTZV").":PRINTMG$(Z
V):NEXTZV:HL=HL+1:GOTO 5002
5300 PRINT"Edit a line":PRINT:INPUT"Enter line to edit or 0 to e
nd";VN:IF VN=0 THEN 5005 ELSE IF VN<0 OR VN>HL THEN PRINT:GOTO53
00 ELSE PRINT"Line"VN".":PRINT"Old line:":PRINTMG$(VN):MG$(VN)="
":PRINT:PRINT"Enter new line
5301 A$=INKEY$:IF A$=""THEN 5301 ELSEPRINTA$;:IFASC(A$)=13THEN53
02 ELSE IF ASC(A$)=8ANDLEN(MG$(VN))>0THENMG$(VN)=LEFT$(MG$(VN),L
```

Listing continues

in Basic or adding lines, all of the variables were cleared. There had to be a way to store messages.

I knew that messages couldn't be stored in variables; there had to be another way. Then I though of how Basic stores variables by POKEing ASCII values into memory. I recalled that the question "Memory Size?" appears every time the computer is turned on. I knew this had something to do with protecting memory, so I figured that I would write a short subroutine to POKE strings into memory. But, the question was: "Would it work?"

I tried to POKE something into protected memory. I PEEKed at it and printed it, using a PRINT CHR$ (PEEK (X)) instruction (where x is the pointer to the next byte of the message). It worked flawlessly, but my next problem was how to use it in my original program.

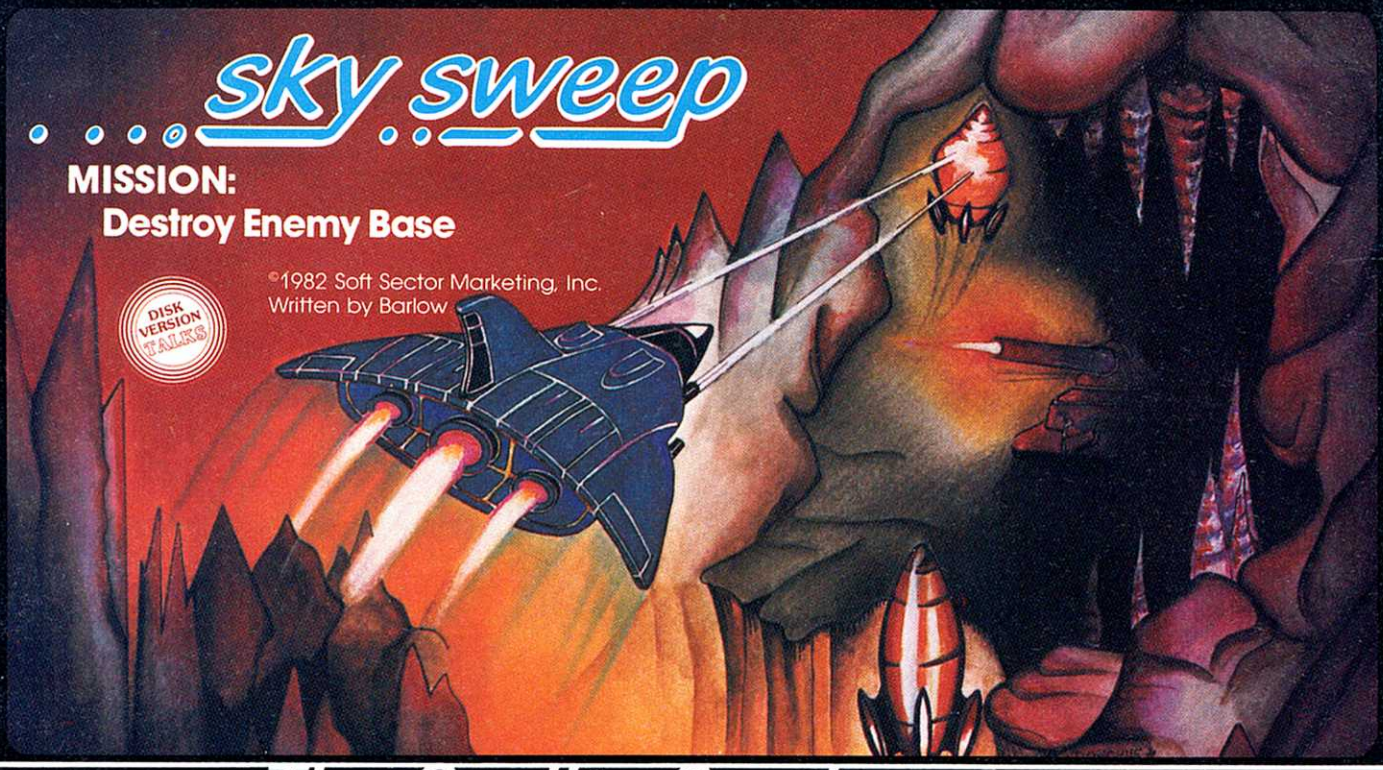
I decided that it would be necessary to save four major parts of any message: the subject, the password, the author, and the body of the message. Next, I determined the order in which the parts should be saved. I decided to save the subject and the author first, since only the author and subject are printed when a scan is done. Having these two items first would save time, since the program wouldn't have to search for them if they were placed at the beginning.

The next thing I decided to save was the password, because when I got around to making a routine to kill messages, the program would have to compare passwords to see if the person requesting the kill was indeed the author. By having the password third I could avoid having the program go through entire bodies of messages to find the passwords.

Finally, I placed the body of the message at the end, because when the body is printed, the author and subject appear before it.

Having determined the order of the parts, I proceeded to put them into my program. I used FOR X = 1 TO LEN (X$): POKE HP, ASC (MID$ (X$, X, 1)): HP = HP + 1: NEXT X: POKE HP, 255 (x is a dummy variable, X$ is the string to save, and HP is the pointer to the next highest memory location). I saved the four message parts and the starting location for each message in the MM array, and the whole routine is located at lines 5010–5011 with a GOSUB to line 39700.

I next had to modify the scan and read sections of the program to ensure that they would be compatible with the



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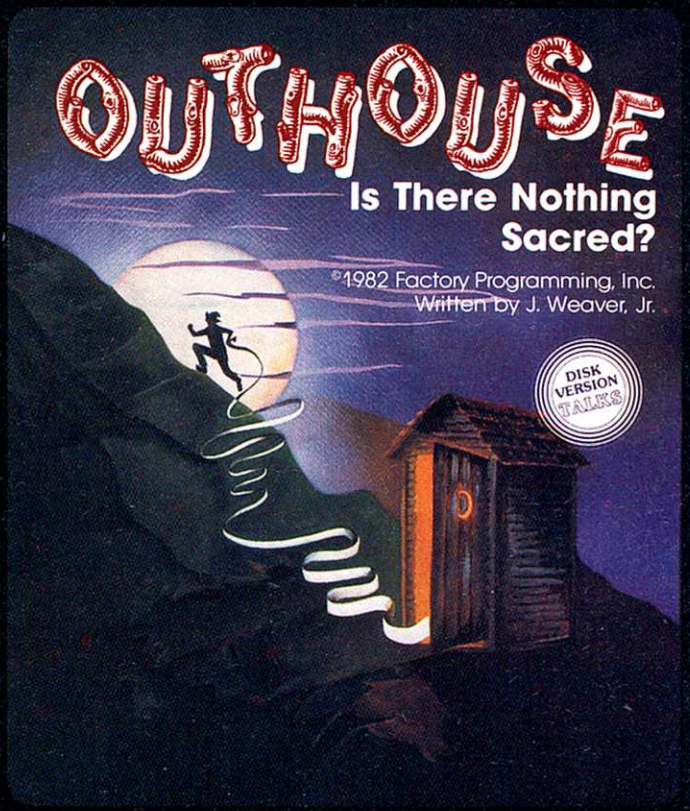

Listing continued

```
EN(MG$(VN))-1):GOTO5301ELSEIF LEN(MG$(VN))>63THEN PRINTCHR$(8);:
GOTO 5301 ELSE MG$(VN)=MG$(VN)+A$:GOTO 5301
5302 PRINT:GOTO5005
5400 PRINT"List":PRINTCHR$(14):INPUT"Starting line #";NL:IF NL<0
 OR NL>HLTHEN PRINT:GOTO 5400 ELSE FOR XH=NL TO HL:PRINTXH").":P
RINTMG$(XH):NEXT XH:PRINT:GOTO 5005
6000 PRINT:PRINT:PRINT"Quiz Questions":PRINT"I will post one que
stion a week. Post answers in comments to me when you hang up. T
hank You."
6001 PRINT"Example:":PRINT"  26=L of the A":PRINT"   would be":P
RINT"  26=letters of the alphabet":PRINT"Now for this weeks equa
tion:":PRINT:PRINTQ1$:PRINT:PRINT"Press <ENTER> to return to MAI
N menu"
6002 DU$=INKEY$:IF DU$="" THEN 6002 ELSE PRINT:GOTO 65
6999 PRINTCHR$(14);"Read messages.":IF MG=0THENPRINT"No messages
 yet":PRINT:GOTO65 ELSEPRINT"Cass-80 contains messages 1 to"MG
7000 INPUT"ENTER MESSAGE TO READ,OR 0 TO QUIT";DH:PRINTCHR$(14);
:IFDH<0ORDH>MGTHEN7900ELSEIFDH=0THENPRINT:GOTO65ELSEGOTO29700
7001 RJ=PEEK(KH):IF RJ=255 THEN KH=KH+1:GOTO7002 ELSE SB$=SB$+CH
R$(RJ):KH=KH+1:GOTO 7001
7002 RJ=PEEK(KH):IF RJ=255 THEN KH=KH+1:GOTO 7003 ELSE F$=F$+CHR
$(RJ):KH=KH+1:GOTO 7002
7003 RJ=PEEK(KH):IF RJ=254THEN KH=KH+1:GOTO 7004 ELSE P$=P$+CHR$
(RJ):KH=KH+1:GOTO 7003
7004 PRINT:PRINT"MESSAGE"DH".":PRINT"LEFT BY "F$,"SUBJECT:"SB$:P
RINT
7005 RJ=PEEK(KH):IF RJ=253 THEN 7006 ELSE PRINTCHR$(RJ);:KH=KH+1
:GOTO 7005
7006 PRINT:PRINT"END OF MESSAGE"DH".":GOTO 7000
7900 PRINT"I'M SORRY,BUT THERE IS NO MESSAGE #"DH:DH=0:PRINT:GOT
O7000
8000 PRINT:PRINT"Scan messages":IF MG=0 THENPRINT"No messages ye
t.":PRINT:GOTO 65 ELSEINPUT"Enter message # to start scan with";
GI:IF GI<1 OR GI>MG THEN GOTO 8000ELSE FOR SE=GITOMG:KR=MM(SE)
8001 EX=PEEK(KR):IF EX=255 THEN 8002 ELSE SM$=SM$+CHR$(EX):KR=KR
+1:GOTO 8001
8002 KR=KR+1
8003 EX=PEEK(KR):IFEX=255THEN8005ELSEF$=F$+CHR$(EX):KR=KR+1:GOTO
8003
8005 PRINT"MESSAGE"SE":":PRINT"LEFT BY: "F$,"TO: "MT$(SE):PRINT"
SUBJECT: "SM$:SM$="":F$="":PRINT:NEXTSE:PRINT:PRINT"END OF ";:IF
BD=1THENPRINT"D&D FILE."ELSEPRINT"MAIN FILE."
8006 PRINT:GOTO65
10000 PRINT"LINE FEEDS":PRINT"LINE FEED MODE IS NOW--->>>";:IF P
EEK(-182)=1THENPRINT"OFF<<<---":PRINT:POKE-182,0ELSEPRINT"ON<<<-
--":PRINT:POKE-182,1:GOTO65
10001 GOTO65
11000 OP$="":PH$="":PQ$="":PA$="":NM$="":QN$="":LN$="":PRINT"Wel
come to Cass-80!":PRINT"Hickory Hills, Il"
11001 PRINT"Enter your FIRST name:";:GOSUB25000:QZ$=OP$:IF QZ$="
"THENOP$="":GOTO11001ELSEOP$=""
11002 PRINT"Enter your LAST name:";:GOSUB25000:LN$=OP$:IFLN$=""T
HENOP$="":GOTO11002ELSEOP$=""
11003 NM$=QZ$+" "+LN$:PRINT:PRINT"You are: ";NM$;:PRINT".";CHR$(
13);"Is that correct?";
11004 A$=INKEY$:IFA$=""THEN11004ELSEGOSUB27330:IFA$="Y"THENPRINT
"Yes":A$=INKEY$:RETURNELSEIFA$="N"THENPRINT"No":A$=INKEY$:OP$=""
:GOTO11001ELSE11004
14000 PRINT"Need line feeds "QZ$" (Y/N)?";
14001 A$=INKEY$:IF A$=""THEN 14001 ELSE IF A$="N"OR ASC(A$)=110T
HENPRINT"No":POKE-182,0ELSEIFA$="Y"ORASC(A$)=121THENPRINT"Yes":P
OKE-182,1ELSE14001
14002 RETURN
15000 CLS:PRINTCHR$(14);"CHAT MODE...TYPE 'BYE' TO EXIT":LQ$="YO
U ARE TALKING TO "+NM$:FOR TY=1TOLEN(LQ$):POKE 15807+TY,ASC(MID$
(LQ$,TY,1)):NEXT TY
15001 GOTO 16001
15500 OUT234,165:GOTO5
16000 CLS:PRINT"SYSOP REQUESTS TO TALK WITH YOU":PRINT
16001 PRINT"--)";:OP$="":GOSUB 25000:IF OP$="BYE"THEN PRINT:GOTO
 65 ELSE 16001
16300 MM(1)=HP:FORAB=1TOMG-1:KH=MM(AB)
16301 RJ=PEEK(KH):IFRJ=255THENKH=KH+1:GOTO16302ELSEKH=KH+1:GOTO1
6301
16302 RJ=PEEK(KH):IF RJ=255THENKH=KH+1:GOTO16303ELSEKH=KH+1:GOTO
16302
16303 RJ=PEEK(KH):IFRJ=254THENKH=KH+1:GOTO16304ELSEKH=KH+1:GOTO1
6303
16304 RJ=PEEK(KH):IF RJ=253THENKH=KH+1:GOTO16305ELSEKH=KH+1:GOTO
16304
16305 MM(AB+1)=KH:NEXTAB:HP=KH+1:END
18600 PRINT"System info":PRINT:PRINT"This system is made up of:"
:PRINT"A TRS-80 Model 1":PRINT"level 2 computer with 48K of RAM"
```

Listing continues

save routine. The scan and read routines check for the presence of a 255, 254, or 253 to signal the ends of message sections, and then PEEK the various strings out of memory by doing the opposite of the save routine.

The scheme I used was ER = PEEK (KH): IF ER = 255 THEN next line ELSE X$ = X$ + CHR$ (ER): KH = KH +: GOTO this line (where X$ is the string to be PEEKed out of memory, KH is the pointer to next memory location to PEEK out of; and ER is the dummy variable to store the value of the memory location pointed to by KH). KH starts out equalling an element of array MM. The precise element is determined by the message being read or scanned.

There is one large addition to the read routine at lines 7000–7006 that isn't present in the scan routine at lines 8000–8006. This is the routine to print the body of the message. This routine, located at line 7005, checks for a 253 to signal the end of the message body. If it fails to find a 253, it executes a PRINT CHR$(RJ), where RJ is the value of the memory location presently being PEEKed out of, and the program will keep looping until it finds a value of 253 at the PEEK location pointed to by KH.

After testing this routine and using it for awhile, I decided it would be nice to add another board devoted to playing Dungeons and Dragons.

The addition of the D & D board required another array (DM), another top of memory pointer (DP), another message pointer (DN), and a routine at lines 45500–45551 to exchange the pointers and arrays. When the pointers and arrays are exchanged, the boards are exchanged.

Although this version ran extremely well, users eventually requested the ability to place private messages on both the regular board and the D & D board. Although I knew this would be an enhancement to the system, I was concerned that there just wouldn't be enough memory to make it a reality.

I decided to try putting in another array, MT$ and adding a subroutine to the read message routine in line 7000, to determine whether the message is private or nonprivate. If the subroutine finds the message is private, it then checks to see if the message is for the user who is trying to read it. If the message is not for the user trying to read it, the program informs the user that the requested message is private. If the program determines that the user is authorized to read the message, than it returns and prints it. A special flag (designated TF) can be set to allow whoever

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FEATURES OF THE NEW POSTMAN MASS MAILING SYSTEM

The Postman system (version 2) is an almost COMPLETE rewrite, rethink, redesign of the original POSTMAN. The many features of the new POSTMAN system are quickly outlined below:

MULTI-DRIVE – True multi-drive operation is possible. POSTMAN will search all drives for address files and connect them together into one large file for the duration of that session. Once POSTMAN has found the data files on the disks, the operator "sees" just ONE CONTIGUOUS sorted list of addresses. The operator does not need to tell POSTMAN when to "switch" drives or manually "swap" sections of the data file in and out of the computer's memory. This is the foremost among the list of features because of its relative uniqueness among mail list handlers written for the TRS-80.

LARGE LIST SUPPORT – The multi-drive operation allows the user to access data files on ALL configured drives CONCURRENTLY (at the SAME time) for truly large mailing lists. Files need not be sectioned into smaller "byte size" chunks to fit into memory.

HARD DISK SUPPORT – (HARD DISK POSTMAN only) The FULL utilization of the space and speed of the new hard disk drives is possible with POSTMAN. For example, a 7.5 megabyte drive can be configured to hold almost 60,000 labels. Multiple hard drives can be accessed CONCURRENTLY allowing 200,000++ entry mailing lists.

FORM LETTER CAPABILITY – With the purchase of the separate POSTRITE program, the user is provided with an easy to use form letter generator which will merge a generalized letter produced from a word processing system (i.e. LAZY WRITER, etc.), with the name and address information from the POSTMAN MASS MAILER data base. POSTWRITER allows the user to insert any field from a POSTMAN label entry anywhere in the letter.

MENU OPERATION – As you would in a restaurant, choose your dinner from a list (or MENU). POSTMAN will allow you to direct its actions by selecting from various menus that it will display. A complete discussion of each menu is presented in the manual.

INSERT – New names can be quickly added to your list at any time. The new addresses are placed into the file in their proper sorted order eliminating the need for a separate sort operation after entering a stack of new names. POSTMAN will allow the operator to enter a "batch" of labels without returning to the control menu between each label insertion, thus speeding entry and reducing the aggravation of extra menu control keystrokes.

DELETE – Names can be removed at any time when they are no longer needed.

EDIT – Information in any name entry can be quickly changed at will with "word processor" ease. A "transparent" cursor simply is moved to the label displayed on the computer screen and corrections are just typed over the existing label. If you happen to change a field which is also used as a sort key, POSTMAN will automatically move the changed label to its correct position in the list to maintain the sorted arrangement of the labels.

OVERLAY – When identical changes are needed on many addresses, the OVERLAY feature can make them with one keystroke. The needed changes which are common to many labels are entered into the "overlay mask". When you wish to apply these common changes to any label, one command will do it.

SORT – Arrange your list in any alphabetic or numeric order. The ordering may use one or more fields to control the sort. A machine language heap sort assures fast execution. The sort need only be performed once, the sorted list will stay sorted through all subsequent insertions, deletions, and changes to existing labels. NO NEED to leave the POSTMAN program to use a separate program to sort your data. Your data is sorted quickly and after sort completion, POSTMAN is ready for your next command!

SPECIAL STREET ADDRESS SORT – For the user with many addresses on the same street, POSTMAN will sort your entries by the house NUMBER after grouping those on the same street together. Local city lists can be quickly sorted to aid post office dispatching.

PURGE – Unwanted duplicate addresses can be removed from your list automatically or under operator control.

SEARCH – Any address in your list can be quickly found with fast search and positioning commands. Three different types of searches are provided. A "fast" search which uses a hashing technique, a "selective sequential" search for labels with common fields, and "quick" positioning using the first or major sort field to get you into the general "ball park" of a label or sequence of labels.

LABEL PRINTING – One, a few or all addresses in your list can be printed on standard or non-standard label stock. Up to 6 labels across can be printed with a format YOU can easily control. TWO user definable 'ATTN' lines are provided for any use. Labels can be printed from many of POSTMAN's menus, search, edit, or during label insertion.

EFFICIENCY – POSTMAN is written in the machine's native language to gain the full advantage of the microcomputer's speed. Extensive use of program segmentation reduces the amount of use RAM needed to hold the program, allowing a greater number labels to be kept in core, resulting in faster operation. Little used routines need only be brought into memory when they are needed and once through with their task, release their space back to POSTMAN.

REPORT LISTINGS – A special program to produce columnar listings of address data from your label data base is provided. You can easily specify the information to be printed.

DATA DISK MERGING – Labels can be quickly transferred from one disk to another with the PSTMERGE program callable from the main POSTMAN SYSTEM menu. Source and destination drives needed not be separate drives, prompts to exchange diskettes if the same drive is used, are provided.

DATA DISK PREPARATION UTILITY – Provided with POSTMAN is the DPREP program which allows the user to prepare a floppy/hard disk for use with POSTMAN. This easy to use utility can be told to prepare any portion of the available space on a disk.

DATA INTEGRITY – All data transfers to the disk files are made using special write commands which instructs the operating system to check the validity of EACH write to the disk.

DATA GUARD® – Is a special programming technique only offered by Soft Sector Marketing, Inc. If by chance your machine resets while writing information to the disk, you only lose the information that you were writing. Your files are always protected from the danger of losing all the work that you have put in that day. NO OTHER PROGRAM ON THE MARKET OFFERS THIS PROTECTION. If you reset with ANYBODY'S MAILING PACKAGE DURING WRITING you would destroy your ENTIRE data disk. We can't stop your machine from failing but we can protect your data.

Description of Label Record Fields:

Length	Name	Description	Length	Name	Description
10	Code	User defined printable field	15	City	City, township, village
15	Last Name	Last name of addressee	5	State	State, province, territory
15	First Name	First name of addressee	9	Zip	Zip code, zone, route
26	Company	Name of company	2	Data 1	User definable field
26	Address	Street address	5	Data 2	User definable field

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set it to read any message, whether private or nonprivate.

At this same time I added a routine that scans the MT$ array, allowing users to quickly determine whether any board messages are specifically for them. I also added a user's log so anyone coming into the board could see who had used the bulletin board that day. This log can be reset by setting the value of UL to 0.

The latest version of my bulletin board has been up and running for several weeks now with absolutely no problems. The users are happier than ever with the board, and usage keeps on expanding.

The only negative comment I have had is that sometimes string input is slow. This occurs at times because I cleared only 2,400 bytes in line 0. While I could probably clear 400 more, I decided against it because it would leave no room for further modifications.

Some future enhancements that I anticipate are an expert's users mode, where all menus can be skipped, and a machine-language kill routine to quickly relocate messages and pointers.

The program has run smoothly and flawlessly, serving 933 users in slightly over two months. There have been a tremendous number of favorable comments, and even a number of "I see it running, but I still don't see how it can be done" statements. ■

Scott Steele, age 13, can be reached at 8738 Hillside Drive, Hickory Hills, IL 60457.

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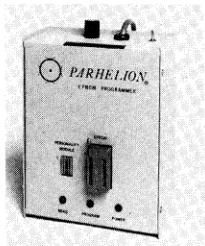

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366

Listing continued

```
:PRINT"A Radio Shack Expansion Interface":PRINT"An RS-232 serial
 interface":PRINT"A Radio Shack direct connect Modem 2"
18601 PRINT"And a Radio Shack cassette recorder":PRINT:GOTO 65
18990 POKE-183,0:POKE-182,1:POKE-185,1:RETURN
22001 DU$=INKEY$:IFDU$="Y"THEN3090ELSEIFDU$="N"THEN65ELSE22001
24900 PRINT"Need nulls "QZ$" (Y/N)?";
24901 A$=INKEY$:IFINP(232)>32THEN5ELSEIFA$=""THEN24901ELSEIFA$="
N"ORASC(A$)=110THENPRINT"No":RETURNELSEIFA$="Y"ORASC(A$)=121THEN
PRINT"Yes":PRINT:GOTO24902ELSE24901
24902 PRINT"How many,"QZ$" (0-255)?";
24903 A$=INKEY$:IFA$=""THEN24903ELSEPRINTA$;:IFASC(A$)=13ORASC(A
$)=10THEN24904ELSEIFASC(A$)<48ORASC(A$)>57THEN24903ELSEDU$=DU$+A
$:IFLEN(DU$)>3THENPRINT:GOTO24902ELSE24903
24904 NU=VAL(DU$):IFNU<0OR NU>255THEN24902ELSEPOKE-183,NU:PRINT:
RETURN
25000 IP$=INKEY$:IFIP$=""THEN25000ELSEIFIP$=CHR$(95)ORIP$=CHR$(1
27)THEN25479ELSEPRINTIP$;:IFASC(IP$)=8ANDLEN(OP$)>0THENOP$=LEFT$
(OP$,LEN(OP$)-1):GOTO25000ELSEIFASC(IP$)=13THENRETURNELSEIFLEN(O
P$)>253THEN25500ELSEOP$=OP$+IP$:GOTO25000
25479 EC=EC+1:IF EC=5THENEC=0:GOTO3095ELSE25000
25500 RETURN
26000 PRINT"Userlog for: ";DE$:PRINT:FORDU=1TOUL:PRINT"("DU").";
UL$(DU):NEXTDU
26001 PRINT:PRINT"END OF FILE.":GOTO65
27000 MT$(MG+1)="":FORAZ=1TOLEN(DU$):AB=ASC(MID$(DU$,AZ,1)):IFAB
>95THENAB=AB-32
27001 IFAB=95THENNEXTAZELSEMT$(MG+1)=MT$(MG+1)+CHR$(AB):NEXTAZ:R
ETURN
27330 IF ASC(A$)>95AND ASC(A$)<127THENA$=CHR$(ASC(A$)-32):RETURN
ELSERETURN
28000 IFNK=1THENNK=0:NK$="OFF"ELSENK=1:NK$="ON"
28001 PRINT"The bell is now-->"NK$"<--":PRINT:GOTO65
29000 FORDU=1TOLEN(NM$):GG=ASC(MID$(NM$,DU,1)):IFGG>95THENGG=GG-
32
29001 PH$=PH$+CHR$(GG):NEXTDU:RETURN
29100 PRINT:PRINT"Your messages":PRINT:PRINT"Checking for your m
essages":PRINT"on the ";:IFBD=1THENPRINT"D&D board."ELSEPRINT"MA
IN board."
29101 IF MG=0THENPRINT"SORRY,NO MESSAGES YET.":GOTO65ELSEFORMW=1
TOMG:IFMT$(MW)=PH$ORLEFT$(MT$(MW),LEN(PH$))=PH$THENPRINT"MESSAGE
"MW"MAY BE FOR YOU,"QZ$:NEXTMWELSENEXTMW
29102 PRINT:PRINT:GOTO65
29400 IFA=1000THENPRINT:PRINT"YOU'RE THE 1000TH CALLER!":C1=1000
:C1$=NM$:RETURNELSE RETURN
29700 IFTF=1THEN29707ELSEIFMT$(DH)="ALL"THEN29707ELSEIFMT$(DH)=P
H$THEN29707ELSEIFRIGHT$(MT$(DH),1)=CHR$(16)THEN29707ELSEPRINT"ME
SSAGE"DH"IS A PRIVATE MESSAGE.":PRINT:GOTO7000
29707 KH=MM(DH):PRINTCHR$(14);:SB$="":P$="":F$="":GOTO7001
31000 PRINT:PRINT"NULL ADJUSTMENT":PRINT"YOU NOW ARE SET AT"PEEK
(-183)"NULLS.":PRINT"HOW MANY NULLS DO YOU NEED(0-255)";:INPUTNL
:IF NL<0 OR NL>255THEN 31000 ELSE POKE-183,NL:PRINT:GOTO 65
39700 FORWY=1TOLEN(F$):POKE HP,ASC(MID$(F$,WY,1)):HP=HP+1:NEXTWY
:POKE HP,255:HP=HP+1:RETURN
39800 PRINT"Saving message. Please wait...":MM(MG)=HP:RETURN
45500 IFBD=1THEN45550ELSEPRINT"Going to D&D board,Please wait...
":BD=1
45501 DU=DP:DP=HP:HP=DU
45502 IF MG>DN THEN45510ELSEFOR SO=1TODN:DU=DM(SO):DM(SO)=MM(SO)
:MM(SO)=DU:DU=SM(SO):SM(SO)=SD(SO):SD(SO)=DU:DU$=MT$(SO):MT$(SO)
=DT$(SO):DT$(SO)=DU$:NEXT SO:PRINT"DONE.":PRINT
45503 DU=DN:DN=MG:MG=DU
45505 IFCF=1THENRETURNELSEGOTO65
45510 FOR SO=1TOMG:DU=DM(SO):DM(SO)=MM(SO):MM(SO)=DU:DU=SM(SO):S
M(SO)=SD(SO):SD(SO)=DU:DU$=MT$(SO):MT$(SO)=DT$(SO):DT$(SO)=DU$:N
EXTSO:PRINT"DONE.":PRINT:GOTO45503
45550 PRINT"Going to MAIN board...Please wait...":BD=2
45551 GOTO45501
54257 GOTO45501
62000 PRINT"AN ERROR HAS BEEN ENCOUNTERED.PLEASE INFORM THE SYSO
P OF ERROR "ERR/2+1;CHR$(8);"IN LINE"ERL".THANK YOU":PRINT:RESUM
E65
63001 INPUTSB$
63002 INPUT"Enter a password for erase (password must be at lea
st 1 char.   long)" ;PW$:IF PW$=""THEN63002ELSE63003
63003 IFSM(MG+1)=1THENMT$(MG+1)="SYSOP":RETURNELSEINPUT"Who is t
his message to (name must be spelled CORRECTLY) or ALL";DU$:IFDU
$=""THEN63003ELSEGOSUB27000
63004 IFMT$(MG+1)="ALL"THEN63005ELSEINPUT"Is this a private mess
age (Y/N)";YN$:IFYN$="N"ORYN$="n"THENMT$(MG+1)=MT$(MG+1)+CHR$(16
)
63005 PRINT"Message"MG+1".","To:"MT$(MG+1):PRINT"Subject:"SB$,:I
FRIGHT$(MT$(MG+1),1)=CHR$(16)ORMT$(MG+1)="ALL"THENPRINT"Non priv
ate."ELSEPRINT"Private."
63006 INPUT"Is THIS information correct? (Y/N)";YN$:IFYN$="Y"ORY
N$="y"THENRETURNELSEPRINT"PLEASE Enter the subject:";:GOTO63001
```

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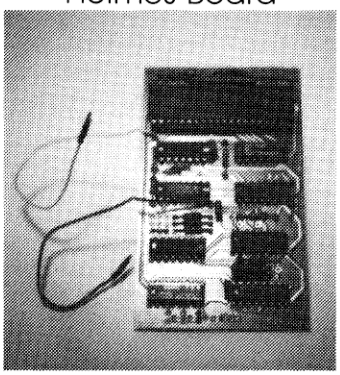

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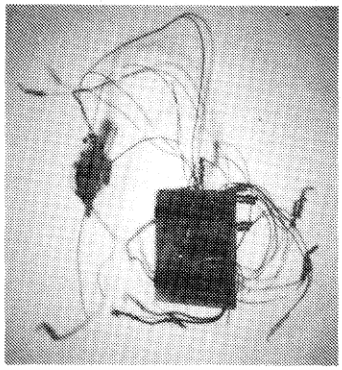
Other Brand



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✓See List of Advertisers on Page 387

Math Countdown

by Adam Wells
Third Place
10 and under

Lines	Purpose
10	Clears the screen
15	Clears 1000 bytes for string space
20	Makes double-sized letters
30–50	Makes the title page
60	Clears the screen
65	Makes double-sized letters
70	Asks if you need instructions
75	Clears the screen and makes double-sized letters
80–90	Figures out your answer
100	Tells you if you answered incorrectly
105	Clears the screen
110–210	Prints the instructions
220	Asks you if you understand the instructions
230–240	Figures out your answer
250	Tells you if you answered incorrectly
255–256	Clears the screen and asks what operation (+,–,×,/) you'd like to do
258	Tells you if you were wrong
260	Clears the screen
270–282	Makes the spaceship
285	Clears the screen
290	Prints the spaceship
300–305	Sets up the loop to give 10 problems and prints 10
310	Makes the addition problem
320	Prints the addition problem and figures out if your answer is correct
330	Tells you if you were wrong
340	Returns control
500	Clears the screen and makes the spaceship take off
505	Returns control
510	Clears the screen
520	Prints the ship
530–540	Prints 10
550	Makes the subtraction problem
560	Prints the subtraction problem and figures out if your answer is correct
570	Tells you if you are incorrect
580	Clears the screen
590	Prints the ship
600–610	Makes 10
620	Makes the multiplication problem
630	Prints the multiplication problem and figures out if you are correct
640	Tells you if you are wrong
650	Makes the division problem
670	Prints the division problem and figures out if you are correct
680	Tells you if you are wrong
690	Gets rid of the Ready prompt by creating an endless loop

Table 1. Line Functions

At my computer programming class, I was assigned to write a math program that would help little children learn basic ideas. Since I like astronomy, I decided to put a spaceship in the program.

Math Countdown will ask if you need directions. If you don't, the program goes right to the math. You can choose the operation you want: multiplication, division, addition, or subtraction. Then a spaceship appears at the bottom of the screen, with the number 10 to the left and a math problem above it. If you answer the problem correctly, the 10 will change to 9, and you will see another problem. If you get that one right, the 9 will change to an 8.

When you get all the way down to zero, the spaceship takes off. If you get a problem wrong, the program will say "Try again!" and repeat the problem.

To revise my program, you could add sound, or give a time limit for solution of each problem. ■

(Listing on p. 163)

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164

```
10 CLS
15 CLEAR 1000
20 PRINTCHR$(23)
30 PRINT@4*64+20,"MATH COUNTDOWN!"
35 PRINT:PRINT:PRINT
40 PRINT"By Adam Wells "
50 FOR X=0 TO 1000:NEXT
60 CLS
65 PRINTCHR$(23)
70 INPUT"Do you need instructions";A$
75 CLS:PRINTCHR$(23)
80 IF A$="YES"THEN 110 ELSE 90
90 IF A$="NO" GOTO 255
100 PRINT"I hope you said 'yes' or 'no' and not 'YES' or 'NO'!":
GOTO 70
105 CLS
110 PRINT"        INSTRUCTIONS!"
115 PRINT"        -*-*-*-*-*-*-"
120 PRINT"I will give you a math"
130 PRINT"problem.A spaceship will be"
140 PRINT"in the background.It will"
150 PRINT"have a '10' by it.If you"
160 PRINT"solve the problem right the '10'";
170 PRINT"will change to a '9'."
180 PRINT"The '9' will change to an '8'"
190 PRINT"and so on........."
200 PRINT"If you get all the way to '0'"
210 PRINT"the spaceship will take off."
220 INPUT"Now,do you understand";B$
230 IF B$="YES"THEN 255
240 IF B$="NO"THEN 120 ELSE 250
250 PRINT"What did you say?":GOTO 220
255 CLS:PRINTCHR$(23);"Type in the number that          correspon
ds to the type of       problem that you'd like to      practice,
 please.":PRINT:PRINT:PRINT"1 => addition":PRINT "2 => subtracti
on":PRINT"3 => multiplication":PRINT"4 => division":PRINT"5 => q
uit
256 GOSUB 270:INPUT "Now, what would you like to     practice";Q
:ON Q GOSUB 285,510,580,1000
258 PRINT "Please enter 1,2,3,4,or 5.":FORQ=1TO500:NEXT:CLS:PRIN
T CHR$(23):GOTO 255
260 CLS
270 SH$=CHR$(176)+STRING$(3,188)+CHR$(176)+CHR$(26)+STRING$(8,24
)+CHR$(176)+CHR$(188)+STRING$(3,131)+CHR$(191)+STRING$(3,131)+CH
R$(188)+CHR$(176)+CHR$(26)+STRING$(14,24)+CHR$(176)+CHR$(188)+ST
RING$(2,191)+STRING$(4,188)+CHR$(191)
280 SH$=SH$ +STRING$(4,188)+STRING$(2,191)+CHR$(188)+CHR$(176)+C
HR$(26)+STRING$(10,24)+STRING$(3,191)
282 RETURN
285 CLS
290 PRINT@10*64+30,SH$;
300 FOR I=1TO10
305 PRINT@64*12+15,11-I;
310 S=RND(4):T=RND(5):U=S+T
320 PRINT@6*64+29,S"+"T"=";:INPUT X:IF X=U THEN NEXT:GOSUB 500:E
ND
330 PRINT@7*64+20,"SORRY,THAT'S INCORRECT.":FORX=1TO500:NEXT:PRI
NT@6*64,STRING$(64,"'"):PRINT@7*64,STRING$(64," "):GOTO 320
340 RETURN
500 CLS:FORI=10 TO 0 STEP-1:PRINT@I*64+30,SH$:FORX=1 TO 10:NEXT:
NEXT
505 RETURN
510 CLS
520 PRINT@10*64+30,SH$;
530 FOR I=1 TO 10
540 PRINT@64*12+15,11-I;
550 S=RND(10):T=RND(S):U=S-T
560 PRINT@6*64+29,S"-"T"=";:INPUT X:IF X=U THEN PRINT@6*64+29,ST
RING$(20," ");:NEXT:GOSUB 500:END
570 PRINT@7*64+20,"THAT IS WRONG.":FOR X=1 TO 500:NEXT:PRINT@6*6
4,STRING$(64," "):PRINT@7*64,STRING$(64," "):GOTO 320
580 CLS
590 PRINT@10*64+30,SH$
600 FOR I=1 TO 10
610 PRINT@64*12+15,11-I
620 S=RND(10):T=RND(10):U=S*T
630 PRINT@6*64+29,S"X"T"=";:INPUT X:IF X=U THEN PRINT@6*64+29,ST
RING$(20," ");:NEXT:GOSUB 500:END
640 PRINT@7*64+20,"THAT IS WRONG.":FOR X=1 TO 500:NEXT:PRINT@6*6
4,STRING$(64," "):PRINT@7*64,STRING$(64," "):GOTO 630
650 U=RND(10):T=RND(10):S=T*U
670 PRINT@6*64+29,S"/"T"=";:INPUT X:IF X=U THEN PRINT@6*64+29,ST
RING$(20," ");:NEXT:GOSUB 500:END
680 PRINT@7*64+20,"THAT IS WRONG.":FOR X=1 TO 500:NEXT:PRINT@6*6
4,STRING$(64," "):PRINT@7*64,STRING$(64," "):GOTO 670
```

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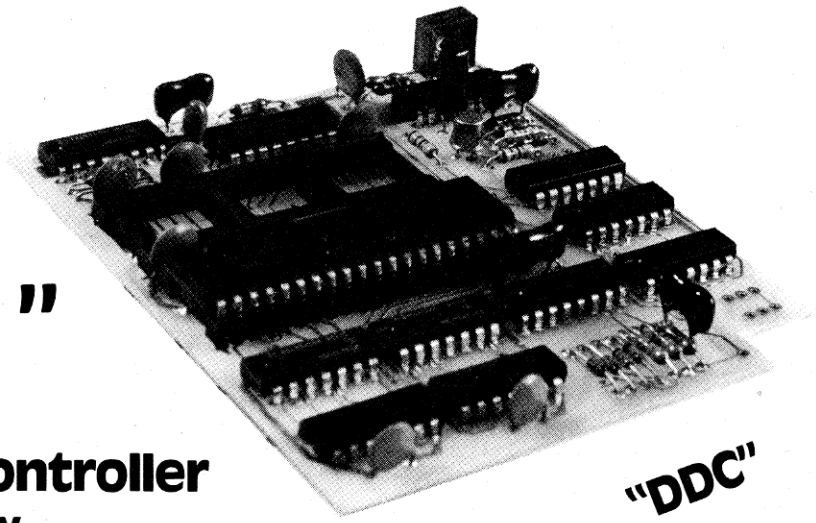

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Tests were conducted on AEROCOMP'S "DDC", Percom's "Doubler A"* and "Doubler II"* and LNW's "LNDoubler"** using a Radio Shack TRS80*** Model I, Level 2, 48 K with TRS80 Expansion Interface and a Percom TFD100 * disk drive (Siemens Model 82). Diskette was Memorex 3401. The test diskette chosen was a well used piece of media to determine performance under adverse conditions. The various double density adapters were installed sequentially in the expansion interface.
The test consisted of formatting 40 tracks on the diskette and writing a 6DB6 data pattern on all tracks. The 6DB6 pattern was chosen because it is recommended as a "worst case" test by manufacturers of drives and diskettes. An attempt was then made to read each sector on the disk once - no retrys. Operating system was Newdos/80, Version 1.0, with Double Zap, Version 2.0. Unreadable sectors were totalled and recorded. The test was run ten times with each double density controller and the data averaged. Test results are shown in the table.

★ Features

TRS80 Model I owners who are ready for reliable double density operation will get (1) 80% more storage per diskette, (2) single and double density data separation with far fewer disk I/O errors, (3) single density compatibility and (4) simple plug-in installation. Compatible with all existing double density software.

★ Value

$139.95 **for the BEST double density controller on the market.**
$179.95 for "DDC" complete with DOSPLUS 3.3D
$229.95 for "DDC" complete with LDOS

★ TEST RESULTS ★

MFR & PRODUCT	SECTORS LOCKED OUT (AVG)
AEROCOMP "DDC"	0
PERCOM "DOUBLER II"	18
PERCOM "DOUBLER A"	250
LNW "LNDOUBLER"	202

Note: test results available upon written request. All tests conducted prior to 8-25-81

Aerocomp's 14 day money back guarantee applies to hardware only.
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The advances that make the "DDC" great are incorporated in the new AEROCOMP Single Density Data Separator ("SDS") and Double Density Data Separator ("DDS").

★ Has your original manufacturer left you holding the bag?

If you already own a Percom "Doubler A", "Doubler II" or LNW "LNDoubler", the AEROCOMP "DDS" will make it right. Look at the test results:

MFR. & PRODUCT	SECTORS LOCKED OUT	
	WITHOUT "DDS"	WITH "DDS"
PERCOM "DOUBLER II"	18	1
PERCOM "DOUBLER A"	250	0
LNW "LNDOUBLER"	202	0

Note: Same test procedures as "DDC".
* Trademark of Percom Data Co.
** Trademark of LNW
*** Trademark of Tandy Corporation

Plugs directly into your existing Double Density Controller. ✓82

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(Shipping $2.00 Cont. US - see opposite page for details)

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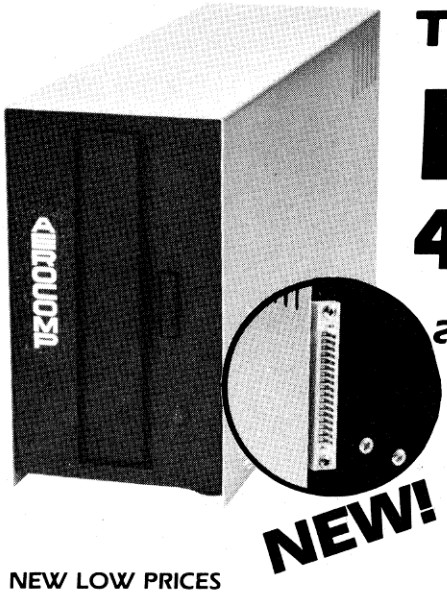
See opposite page ▸▸▸▸▸▸



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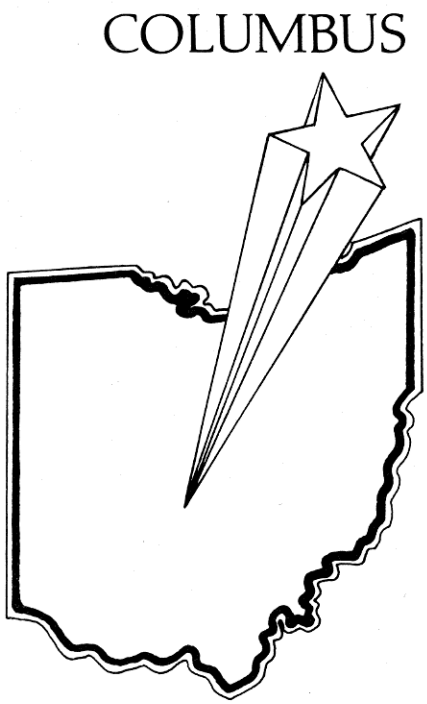
States and Capitals

by Dennis Weide



Quick—what's the capital of Ohio? If you guessed Cleveland, or Toledo, you'd better use this states program to refresh your memory.

The Key Box

Color Computer
32K RAM
Extended Color Basic

My kids needed to learn the names of the states and their capitals, so I wrote this program to help them. It runs on the Color Computer and requires 32K of RAM and Extended Color Basic. For those of you with only 16K of RAM, I have included a short program that draws the map and leaves enough memory free for you to write your own program.

What Does It Do?

Start by entering PCLEAR 8. This clears all the graphics memory available. When you run the program a menu asks if you want to name the states or their capitals. After you enter your choice, the program draws a map of the continental United States on the screen. One state or one of the five Great Lakes is colored in and a dashed cursor ap-

Program Listing 1. 32K Version

```
10 '      STATES AND CAPITALS
20 '
30 '      BY DENNIS H. WEIDE
40 '
50 '         (C)  1982
60 CLS
70 PMODE4,5:PCLS:PMODE4,1:PCLS
80 PRINT:PRINTSTRING$(32,"%");
90 PRINTTAB(6)"STATES AND CAPITALS"
100 PRINTTAB(14)"BY":PRINTTAB(9)"DENNIS WEIDE":PRINTTAB(11)"(C)
1982"
110 PRINTSTRING$(32,"%")
120 PRINTTAB(6)"1. NAME THE STATES":PRINT
130 PRINTTAB(6)"2. NAME THE CAPITALS"
140 H$="CORRECT":J$="WRONG"
150 DIMA(1):DIMB(1)
160 DIMS$(53):DIMS1(53)
170 DIMS2(53):DIMIC(53)
180 DIMC(1):DIMD(1)
190 DIME(1):DIMF(1)
200 DIMG(1):DIMH(1)
210 DIMI(1):DIMJ(1)
220 DIMK(1):DIML(1)
230 DIMM(1):DIMN(1)
240 DIMO(1):DIMP(1)
250 DIMQ(1):DIMR(1)
260 DIMS(1):DIMT(1)
270 DIMU(1):DIMV(1)
280 DIMW(1):DIMX(1)
290 DIMY(1):DIMZ(1)
300 DIMZZ(1):DIMAA(1)
310 DIMSC$(53)
320 FORY=1TO53:READS$(Y),S1(Y),S2(Y)
330 NEXTY
```

Listing 1 continues

Listing 1 continued

```
340 FORY=1TO53:READSC$(Y):NEXTY
350 '       DRAW LETTERS
360 PMODE4,1
370 PCLS5:COLOR0,1:DRAW"BM12,104;U8R4D8U4L4"
380 GET(12,96)-(16,104),A,G
390 PCLS:DRAW"BM12,104;U8R3D4L3R4D4L4"
400 GET(12,96)-(16,104),B,G
410 PCLS:DRAW"BM12,104;U8R4D2BD4D2L4":GET(12,96)-(16,104),C,G
420 PCLS:DRAW"BM12,104;U8R2F2D4G2L2":GET(12,96)-(16,104),D,G
430 PCLS:DRAW"BM12,104;R4L4U4NR3U4R4":GET(12,96)-(16,104),E,G
440 PCLS:DRAW"BM12,104;U4NR3U4R4":GET(12,96)-(16,104),F,G
450 PCLS:DRAW"BM12,104;U8R4BD4NL2D4L4":GET(12,96)-(16,104),G,G
460 PCLS:DRAW"BM12,104;U8D4R4U4D8":GET(12,96)-(16,104),H,G
470 PCLS:DRAW"BM12,104;R4L2U8L2R4":GET(12,96)-(16,104),I,G
480 PCLS:DRAW"BM12,104;U4D4R4U8":GET(12,96)-(16,104),J,G
490 PCLS:DRAW"BM12,104;U8BR4G4E2":LINE-(16,104),PSET:GET(12,96)-
(16,104),K,G
500 PCLS:DRAW"BM12,104;NR4U8":GET(12,96)-(16,104),L,G
510 PCLS:DRAW"BM12,104;U8R2ND3R2D8":GET(12,96)-(16,104),M,G
520 PCLS:DRAW"BM12,104;U8":LINE(12,96)-(16,104),PSET:LINE-(16,96
),PSET:GET(12,96)-(16,104),N,G
530 PCLS:DRAW"BM12,104;U8R4D8L4":GET(12,96)-(16,104),O,G
540 PCLS:DRAW"BM12,104;U8R4D4L4":GET(12,96)-(16,104),P,G
550 PCLS:DRAW"BM12,104;U8R4D8NH3L4":GET(12,96)-(16,104),Q,G
560 PCLS:DRAW"BM12,104;U8R4D4L4F4":GET(12,96)-(16,104),R,G
570 PCLS:DRAW"BM12,104;NU1R4U4L4U4R4D1":GET(12,96)-(16,104),S,G
580 PCLS:DRAW"BM12,104;BR2U8L2R4":GET(12,96)-(16,104),T,G
590 PCLS:DRAW"BM12,104;U8BR4D8L4":GET(12,96)-(16,104),U,G
600 PCLS:DRAW"BM12,104;BU8D6F2E2U6":GET(12,96)-(16,104),V,G
610 PCLS:DRAW"BM12,104;U8BR4D8L2NU2L2":GET(12,96)-(16,104),W,G
620 PCLS:DRAW"BM12,104;U2E4U2BL4D2F4D2":GET(12,96)-(16,104),X,G
630 PCLS:DRAW"BM12,104;BU8D2F2ND4E2U2":GET(12,96)-(16,104),Y,G
640 PCLS:LINE(12,96)-(16,96),PSET:LINE-(12,104),PSET:LINE-(16,10
4),PSET:GET(12,96)-(16,104),Z,G
650 PCLS:GET(12,96)-(16,104),ZZ,G
660 DRAW"BM12,104;R4":GET(12,96)-(16,104),AA,G
670 PRINT:PRINT
680 PRINTTAB(5)"ENTER ONE OF THE ABOVE";
690 WW=RND(9999):GS$=INKEY$:IF GS$=""THEN690
700 GS=VAL(GS$):CLS:IFGS<1ORGS>2THENGS=1
710 NQ=10
720 PMODE4,1:PCLS5:SCREEN1,1:GOTO1090
730 B$=B$+A$
740 RETURN
750 A1=A1+8:A3=A3+8
760 IFA$="A"THENPUT(A1,A2)-(A3,A4),A,PSET:GOTO730
770 IFA$="B"THENPUT(A1,A2)-(A3,A4),B,PSET:GOTO730
780 IFA$="C"THENPUT(A1,A2)-(A3,A4),C,PSET:GOTO730
790 IFA$="D"THENPUT(A1,A2)-(A3,A4),D,PSET:GOTO730
800 IFA$="E"THENPUT(A1,A2)-(A3,A4),E,PSET:GOTO730
810 IFA$="F"THENPUT(A1,A2)-(A3,A4),F,PSET:GOTO730
820 IFA$="G"THENPUT(A1,A2)-(A3,A4),G,PSET:GOTO730
830 IFA$="H"THENPUT(A1,A2)-(A3,A4),H,PSET:GOTO730
840 IFA$="I"THENPUT(A1,A2)-(A3,A4),I,PSET:GOTO730
```

Listing 1 continues

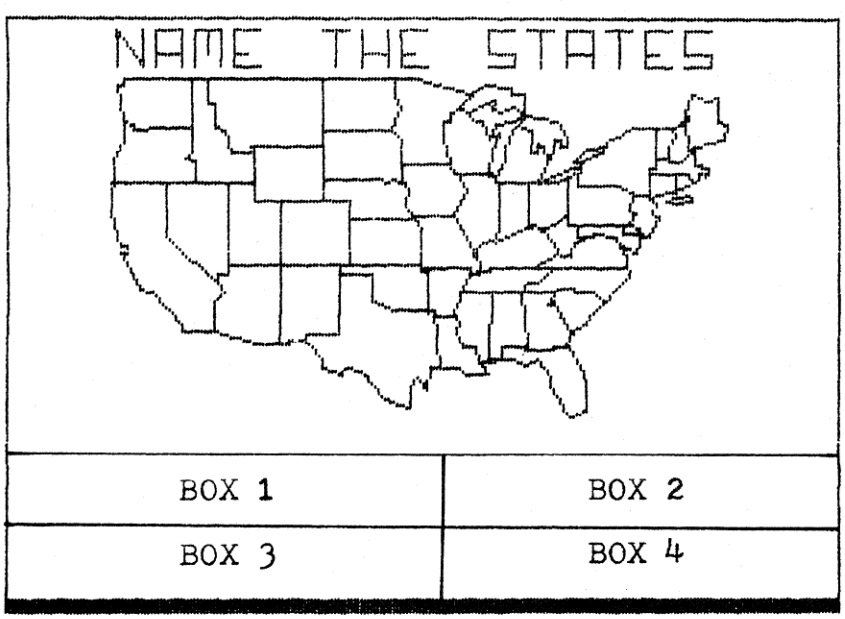


Figure 1

pears in box 1 (see Fig. 1). As you type your answer it appears in this box.

Press enter after completing your answer and you will hear a short musical tune. Then box 2 tells you whether you are correct. If you are wrong, the correct answer appears in box 3; otherwise, this box remains blank. Box 4 is used to display the complement of the correct answer. (If you are naming states, it displays capitals, and vice versa.)

After every 10 questions, the program displays your score and asks if you wish to answer 10 more questions. This will continue until you respond with "no" or name all the states or capitals. There are 48 questions if you choose to name the capitals and 53 questions if you choose to name the states and Great Lakes.

Here's How It Works

To see how the program works, let's look at Program Listing 1 and Table 1. Lines 1150 and 1160 choose which graphics pages are displayed on the screen. While one map is displayed on the screen, another is being drawn on the pages not displayed. After you have answered the question, the program switches graphics pages and the map appears with another state colored in.

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87 Scooter Lane
Hicksville, N.Y. 11801

Listing 1 continued

```
850 IFA$="J"THENPUT(A1,A2)-(A3,A4),J,PSET:GOTO730
860 IFA$="K"THENPUT(A1,A2)-(A3,A4),K,PSET:GOTO730
870 IFA$="L"THENPUT(A1,A2)-(A3,A4),L,PSET:GOTO730
880 IFA$="M"THENPUT(A1,A2)-(A3,A4),M,PSET:GOTO730
890 IFA$="N"THENPUT(A1,A2)-(A3,A4),N,PSET:GOTO730
900 IFA$="O"THENPUT(A1,A2)-(A3,A4),O,PSET:GOTO730
910 IFA$="P"THENPUT(A1,A2)-(A3,A4),P,PSET:GOTO730
920 IFA$="Q"THENPUT(A1,A2)-(A3,A4),Q,PSET:GOTO730
930 IFA$="R"THENPUT(A1,A2)-(A3,A4),R,PSET:GOTO730
940 IFA$="S"THENPUT(A1,A2)-(A3,A4),S,PSET:GOTO730
950 IFA$="T"THENPUT(A1,A2)-(A3,A4),T,PSET:GOTO730
960 IFA$="U"THENPUT(A1,A2)-(A3,A4),U,PSET:GOTO730
970 IFA$="V"THENPUT(A1,A2)-(A3,A4),V,PSET:GOTO730
980 IFA$="W"THENPUT(A1,A2)-(A3,A4),W,PSET:GOTO730
990 IFA$="X"THENPUT(A1,A2)-(A3,A4),X,PSET:GOTO730
1000 IFA$="Y"THENPUT(A1,A2)-(A3,A4),Y,PSET:GOTO730
1010 IFA$="Z"THENPUT(A1,A2)-(A3,A4),Z,PSET:GOTO730
1020 IFA$="."THEN4690
1030 IFA$=" "THENPUT(A1,A2)-(A3,A4),ZZ,PSET:GOTO730
1040 IFA$=CHR$(8)THEN1070
1050 A1=A1-8:A3=A3-8
1060 GOTO740
1070 GOSUB4350:GOTO740
1080 B$=B$+A$:GOTO740
1090 '      DRAW MAP
1100 NP=NP+1:NO=NO+1:IF NO>NQ THEN4230
1110 IFNP>53THEN4230
1120 IFGS=2ANDNP>48THEN4230
1130 NR=NR+1
1140 IFV=1THEN1160
1150 PMODE 4,1:PCLS5:GOTO1170
1160 PMODE 4,5:PCLS5
1170 A$="":B$=""
1180 COLOR0,1
1190 LINE(0,0)-(255,191),PSET,B
1200 LINE(135,142)-(135,192),PSET
1210 LINE(0,142)-(255,142),PSET
1220 LINE(0,166)-(255,166),PSET
1230 LINE(34,4)-(42,16),PSET:DRAW"BM34,16;U12BR8D12BR4U12R8D8NL8
```

Listing 1 continues

Lines 1320–3780 each use a full statement to draw the map rather than a series of For...Next loops. This method draws the map faster since the program does not have to read data for the loops.

Line Numbers	Function
10–50	Program header
60–130	Display program menu
140	Define answer string (H$,J$)
150–310	Dimension all arrays
320–340	Read data statements
350–660	Draw and save high-resolution graphics letters
670–710	Select game (states or capitals)
720	Display hi-res screen
750–1060	Display letter pressed on hi-res screen
1090–3780	Draw map of U.S.A.
3790	Clear keyboard buffer
3800–3890	Choose state and screen, draw cursor
3900	Scan keyboard buffer for key pressed
4130–4210	Data (name of states)
4220	Additional Paint command for Michigan
4230–4330	End of round—try again?
4410–4450	Data (name of capitals)
4500–4580	Convert INKEY$ to string for display
4700–4720	Sound routines for right or wrong answer

Table 1. Line Description

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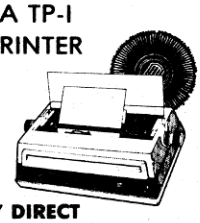

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✓See List of Advertisers on Page 387

Listing 1 continued

```
D4BR4U12R4ND8R4D12BR4NR8U4NR4U8R8"
1240 IFGS=2THEN1260
1250 DRAW"BR7"
1260 DRAW"BR12R4ND12R4BR4D12U4R8NU8D4BR4NR8U4NR4U8R8"
1270 IFGS=2THEN1310
1280 DRAW"BR7"
1290 DRAW"BR12BD12R8U4L8U8R8BR4R4ND12R4BR4ND12R8D8NL8D4BR8U12NL4
R4BR4NR8D8NR4D4R8BR4R8U4L8U8R8"
1300 GOTO1320
1310 DRAW"BR12R8ND2L8D12R8NU2BR4U12R8D8NL8D4BR4U12R8D8L8U8R8BR4R
2NR2D12NL2R2BR8U12NL4R4BR4R8D12BL8U4NR8U8R8BR4D12R8BR4NU2R8U4L8U
8R8D2"
1320 LINE(36,20)-(36,22),PSET
1330 LINE-(34,22),PSET
1340 LINE-(36,34),PSET
1350 LINE-(36,41),PSET
1360 LINE-(33,47),PSET
1370 LINE-(32,64),PSET
1380 LINE-(35,75),PSET
1390 DRAW"R2D2L2"
1400 LINE-(41,89),PSET
1410 LINE-(45,90),PSET
1420 LINE-(54,101),PSET
1430 LINE-(54,103),PSET
1440 LINE-(64,103),PSET
1450 LINE-(77,107),PSET
1460 LINE-(87,107),PSET
1470 DRAW"U1R5"
1480 LINE-(97,112),PSET
1490 LINE-(97,115),PSET
1500 LINE-(103,117),PSET
1510 LINE-(104,115),PSET
1520 LINE-(109,116),PSET
1530 LINE-(116,125),PSET
1540 LINE-(124,128),PSET
1550 LINE-(124,122),PSET
1560 LINE-(126,118),PSET
1570 LINE-(129,122),PSET
1580 LINE-(130,115),PSET
1590 LINE-(139,115),PSET
1600 LINE-(141,117),PSET
1610 LINE-(148,117),PSET
1620 LINE-(145,113),PSET
1630 LINE-(156,112),PSET
1640 LINE-(160,114),PSET
1650 LINE-(163,112),PSET
1660 LINE-(167,118),PSET
1670 LINE-(167,121),PSET
1680 LINE-(171,127),PSET
1690 LINE-(171,129),PSET
1700 LINE-(173,131),PSET
1710 LINE-(178,129),PSET
1720 LINE-(178,121),PSET
1730 LINE-(177,116),PSET
1740 LINE-(172,107),PSET
1750 LINE-(175,102),PSET
1760 LINE-(178,101),PSET
1770 LINE-(179,98),PSET
1780 LINE-(191,85),PSET
1790 LINE-(189,75),PSET
1800 LINE-(193,77),PSET
1810 LINE-(194,75),PSET
1820 LINE-(194,72),PSET
1830 LINE-(197,72),PSET
1840 LINE-(200,65),PSET
1850 LINE-(198,64),PSET
1860 LINE-(199,61),PSET
1870 LINE-(197,59),PSET
1880 LINE-(207,56),PSET
1890 LINE-(212,53),PSET
1900 DRAW"U2R2D1"
1910 LINE-(215,51),PSET
1920 DRAW"U2L2U1L2U6"
1930 LINE-(220,40),PSET
1940 LINE-(221,35),PSET
1950 LINE-(218,34),PSET
1960 LINE-(218,26),PSET
1970 LINE-(215,27),PSET
```

Listing 1 continues

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SPECIALS THIS MONTH:

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PROWRITER 1550	$669	$749
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F-10 55 CPS	$1,615	$1,615
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Listing 1 continued

```
1980 LINE-(210,25),PSET
1990 LINE-(207,35),PSET
2000 LINE-(204,36),PSET
2010 LINE-(192,36),PSET
2020 LINE-(181,43),PSET
2030 LINE-(178,43),PSET
2040 LINE-(174,47),PSET
2050 DRAW"R2D2L2"
2060 LINE-(163,54),PSET
2070 LINE-(168,43),PSET
2080 DRAW"U3R2D2R2U2"
2090 LINE-(169,34),PSET
2100 LINE-(159,32),PSET
2110 DRAW"U7L4U2"
2120 LINE-(147,22),PSET
2130 LINE-(142,25),PSET
2140 LINE-(126,20),PSET
2150 LINE-(36,20),PSET
2160 LINE(36,34)-(39,35),PSET
2170 DRAW"D2"
2180 LINE-(48,36),PSET
2190 LINE-(57,36),PSET
2200 LINE(57,20)-(57,44),PSET
2210 LINE-(55,46),PSET
2220 LINE-(58,47),PSET
2230 LINE-(58,53),PSET
2240 LINE(32,54)-(75,54),PSET
2250 LINE(49,54)-(49,72),PSET
2260 LINE-(65,87),PSET
2270 LINE-(67,90),PSET
2280 LINE-(64,93),PSET
2290 LINE-(64,103),PSET
2300 LINE(68,54)-(68,84),PSET
2310 DRAW"L3D3"
2320 DRAW"BM62,20;D8R2D8"
2330 LINE-(67,37),PSET
2340 LINE-(69,44),PSET
2350 DRAW"R7U2D2D16R21U40"
2360 LINE(75,42)-(97,42),PSET
2370 LINE(76,60)-(105,60),PSET
2380 LINE(84,60)-(84,107),PSET
2390 LINE(68,81)-(127,81),PSET
2400 LINE(105,60)-(105,81),PSET
2410 LINE(102,81)-(102,104),PSET
2420 LINE-(92,104),PSET
2430 LINE-(92,106),PSET
2440 LINE(102,84)-(112,84),PSET
2450 LINE-(112,93),PSET
2460 LINE-(119,96),PSET
2470 LINE-(131,96),PSET
2480 LINE-(133,115),PSET
2490 DRAW"BM127,81;D2R2D14"
2500 LINE(119,20)-(119,26),PSET
2510 LINE-(121,29),PSET
2520 LINE-(118,37),PSET
2530 LINE-(97,37),PSET
2540 LINE(118,37)-(121,40),PSET
2550 LINE-(121,54),PSET
2560 LINE-(118,53),PSET
2570 LINE-(117,54),PSET
2580 LINE-(115,53),PSET
2590 LINE-(97,53),PSET
2600 LINE(121,53)-(123,56),PSET
2610 LINE-(122,62),PSET
2620 LINE-(125,66),PSET
2630 LINE-(127,69),PSET
2640 LINE-(127,81),PSET
2650 LINE(105,66)-(125,66),PSET
2660 LINE(143,25)-(136,32),PSET
2670 DRAW"D2L2"
2680 LINE-(134,40),PSET
2690 LINE-(137,51),PSET
2700 LINE-(148,51),PSET
2710 DRAW"D1R2"
2720 LINE(121,48)-(135,48),PSET
2730 LINE(138,51)-(141,57),PSET
2740 LINE-(137,65),PSET
2750 LINE-(124,65),PSET
2760 LINE(149,51)-(150,53),PSET
2770 LINE-(151,56),PSET
2780 LINE-(151,70),PSET
2790 LINE-(149,73),PSET
2800 LINE-(145,75),PSET
2810 LINE-(143,78),PSET
2820 LINE(137,65)-(145,81),PSET
2830 DRAW"D3L3U2L14"
2840 LINE(142,84)-(137,97),PSET
2850 DRAW"D1L6"
2860 LINE(137,97)-(139,100),PSET
2870 LINE-(138,103),PSET
2880 LINE-(140,108),PSET
2890 LINE-(144,108),PSET
2900 LINE-(145,113),PSET
2910 LINE(139,90)-(168,90),PSET
2920 LINE(149,90)-(148,112),PSET
2930 DRAW"R4U4R8"
2940 LINE-(158,90),PSET
2950 DRAW"BM159,109;R9U1R4"
2960 LINE(173,104)-(168,93),PSET
2970 DRAW"D1L2"
2980 LINE-(169,89),PSET
2990 DRAW"R5D1R6"
3000 LINE(180,90)-(183,93),PSET
3010 DRAW"BM144,83;R4U1R41"
3020 LINE(158,90)-(160,87),PSET
3030 LINE-(163,87),PSET
3040 LINE-(168,82),PSET
3050 LINE(149,73)-(150,74),PSET
3060 LINE-(153,72),PSET
3070 LINE-(154,72),PSET
3080 LINE-(160,69),PSET
3090 LINE-(160,54),PSET
3100 LINE(160,67)-(161,69),PSET
3110 LINE-(162,68),PSET
3120 LINE-(165,70),PSET
3130 LINE-(170,78),PSET
3140 LINE-(173,78),PSET
3150 LINE-(174,74),PSET
3160 LINE-(177,73),PSET
```

Listing 1 continues

UPGRADE

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Listing 1 continued

```
3170 LINE-(178,72),PSET
3180 LINE-(181,71),PSET
3190 LINE-(187,72),PSET
3200 LINE-(189,77),PSET
3210 LINE(163,81)-(168,78),PSET
3220 LINE(136,31)-(140,30),PSET
3230 LINE-(144,34),PSET
3240 LINE-(146,34),PSET
3250 LINE-(148,40),PSET
3260 LINE-(151,38),PSET
3270 LINE-(149,44),PSET
3280 LINE-(148,51),PSET
3290 LINE(142,31)-(150,27),PSET
3300 LINE-(149,30),PSET
3310 LINE-(152,31),PSET
3320 LINE-(156,29),PSET
3330 LINE-(159,33),PSET
3340 LINE-(155,34),PSET
3350 LINE-(150,35),PSET
3360 LINE-(149,39),PSET
3370 LINE(159,33)-(155,37),PSET
3380 LINE-(153,43),PSET
3390 LINE-(153,47),PSET
3400 LINE-(150,53),PSET
3410 LINE(157,35)-(161,37),PSET
3420 DRAW"D7R2U3"
3430 LINE-(165,42),PSET
3440 LINE-(166,47),PSET
3450 LINE(150,54)-(169,54),PSET
3460 LINE-(176,50),PSET
3470 LINE-(176,47),PSET
3480 LINE-(183,44),PSET
3490 LINE-(184,42),PSET
3500 LINE(172,52)-(172,68),PSET
3510 LINE-(191,68),PSET
3520 LINE-(194,69),PSET
3530 LINE-(194,72),PSET
3540 DRAW"BM189,68;D3R6"
3550 LINE(172,64)-(169,67),PSET
3560 LINE-(164,70),PSET
3570 DRAW"BM175,68;D4R5"
3580 DRAW"BM175,51;D4R13"
3590 LINE-(193,58),PSET
3600 DRAW"R4U9R2U12"
3610 LINE(192,58)-(191,63),PSET
3620 LINE-(193,64),PSET
3630 LINE-(191,68),PSET
3640 LINE(197,51)-(209,51),PSET
3650 LINE-(210,54),PSET
3660 LINE(205,51)-(205,57),PSET
3670 LINE(199,46)-(207,47),PSET
3680 LINE-(210,44),PSET
3690 LINE(204,36)-(205,39),PSET
3700 LINE-(203,43),PSET
3710 LINE-(203,47),PSET
3720 LINE(209,32)-(208,35),PSET
3730 LINE-(209,43),PSET
3740 LINE-(210,43),PSET
3750 LINE(202,60)-(209,58),PSET
3760 LINE-(210,60),PSET
3770 LINE-(206,61),PSET
3780 LINE-(202,60),PSET
3790 POKE135,0
3800 IFNP>53THEN4230
3810 IFGS=2ANDNP>48THEN4230
3820 X=RND(53):IFIC(X)=1THEN3820
3830 IFGS=2ANDX>48THEN3820
3840 IFX=35THENGOSUB4220
3850 IC(X)=1:PAINT(S1(X),S2(X)),0,0
3860 IFV=0THENV=1ELSEV=0
3870 SCREEN1,1
3880 A1=8:A2=152:A3=12:A4=160
3890 PUT(A1+8,A2)-(A3+8,A4),AA,PSET
3900 WW=RND(9999):A$=INKEY$:IFA$=""THEN3900
3910 IFA$=CHR$(13)THEN3940
3920 GOSUB750
3930 GOTO3890
3940 TF=TF+1:PUT(A1+8,A2)-(A3+8,A4),ZZ,PSET:IFGS=2THEN4590
```

Listing 1 continues

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Listing 1 continued

```
3950 IFS$(X)=B$THEN4050
3960 A1=135:A2=152:A3=139:A4=160
3970 GOSUB4700
3980 GOSUB4500
3990 A1=8:A2=172:A3=12:A4=180
4000 GOSUB4530
4010 A1=135:A2=172:A3=139:A4=180
4020 GOSUB4460
4030 FORSA=1TO100:NEXTSA
4040 GOTO1090
4050 A1=135:A2=152:A3=139:A4=160
4060 GOSUB4720
4070 GOSUB4560
4080 A1=135:A2=172:A3=139:A4=180:GOSUB4460
4090 FORSA=1TO5:NEXTSA
4100 B$="":A$=""
4110 TC=TC+1
4120 GOTO1090
4130 DATASOUTH CAROLINA,176,98,GEORGIA,164,100,FLORIDA,172,116,K
ENTUCKY,160,76,TENNESSEE,160,84,ALABAMA,152,100
4140 DATAMISSISSIPPI,144,100,ARKANSAS,132,88,LOUISIANA,136,108,O
KLAHOMA,120,88,TEXAS,116,108,MONTANA,80,32,IDAHO,64,44
4150 DATAWYOMING,88,52,COLORADO,92,72,NEW MEXICO,92,92,ARIZONA,7
6,92,UTAH,76,72,NEVADA,60,72,WASHINGTON,48,28
4160 DATAOREGON,48,44,CALIFORNIA,44,80,MAINE,212,32,MASSACHUSETT
S,204,48,NEW HAMPSHIRE,204,44,VERMONT,200,40
4170 DATARHODE ISLAND,208,52,CONNECTICUT,200,52,NEW YORK,188,48,
NEW JERSEY,196,64,PENNSYLVANIA,184,64
4180 DATAOHIO,164,60,INDIANA,156,60,ILLINOIS,144,60,MICHIGAN,160
,48,WISCONSIN,140,40
4190 DATAMINNESOTA,128,36,IOWA,128,56,MISSOURI,132,72,NORTH DAKO
TA,108,28,SOUTH DAKOTA,108,44,NEBRASKA,108,60
4200 DATAKANSAS,108,76,DELAWARE,192,70,MARYLAND,184,70,VIRGINIA,
180,76,WEST VIRGINIA,172,72,NORTH CAROLINA,176,84
4210 DATALAKE ONTARIO,180,44,LAKE SUPERIOR,148,24,LAKE MICHIGAN,
152,36,LAKE HURON,164,36,LAKE ERIE,170,52
4220 PAINT(148,32),0,0:RETURN
4230 FORX=1TO1000:NEXTX:PCLS5:CLS:PRINT:PRINTTAB(5)"YOUR TEST IS
 FINISHED"
4240 PRINT:PRINTTAB(6)"TOTAL QUESTIONS =";TF
4250 PRINT:PRINTTAB(7)"YOUR SCORE IS"INT((TC/NR)*100);"%"
4260 IFNP>53THEN4330
4270 IFGS=2ANDNP>48THEN4330
4280 PRINT:PRINTTAB(8)"TRY AGAIN(Y/N)?";
4290 D$=INKEY$:IFD$=""THEN4290
4300 IF D$="Y"THEN4310ELSE4330
4310 NP=NP-1:NO=0:V=0:NQ=10
4320 PMODE4,1:PCLS:PMODE4,5:PCLS:GOTO720
4330 PRINT:PRINT:PRINTTAB(10)"GAME IS OVER.":PRINT:PRINTTAB(8)"S
EE YOU LATER!!!"
4340 END
4350 PUT(A1,A2)-(A3,A4),ZZ,PSET:A1=A1-8:A3=A3-8
4360 PUT(A1,A2)-(A3,A4),ZZ,PSET
4370 IFB$=""THENRETURN
4380 L=LEN(B$)-1:C$=LEFT$(B$,L):B$=C$
4390 A1=A1-8:A3=A3-8
4400 B$=C$:RETURN
4410 DATACOLUMBIA,ATLANTA,TALLAHASSEE,FRANKFORT,NASHVILLE,MONTGO
MERY,JACKSON,LITTLE ROCK,BATON ROUGE,OKLAHOMA CITY,AUSTIN,HELENA
,BOISE
4420 DATACHEYENNE,DENVER,SANTA FE,PHOENIX,SALT LAKE CITY,CARSON
CITY,OLYMPIA,SALEM,SACRAMENTO,AUGUSTA,BOSTON,CONCORD,MONTPELIER
4430 DATAPROVIDENCE,HARTFORD,ALBANY,TRENTON,HARRISBURG,COLUMBUS,
INDIANAPOLIS,SPRINGFIELD,LANSING,MADISON,ST. PAUL,DES MOINES,JEF
FERSON CITY
4440 DATABISMARCK,PIERRE,LINCOLN,TOPEKA,DOVER,ANNAPOLIS,RICHMOND
,CHARLESTON,RALEIGH
4450 DATA" "," "," "," "," "
4460 L=LEN(SC$(X)):FORT=1TOL:A$=MID$(SC$(X),T,1):GOSUB750
4470 NEXTT
4480 RETURN
4490 RETURN
4500 L=LEN(J$):FORT=1TOL:A$=MID$(J$,T,1):GOSUB750
4510 NEXTT
4520 RETURN
4530 L=LEN(S$(X)):FORT=1TOL:A$=MID$(S$(X),T,1):GOSUB750
4540 NEXTT
4550 RETURN
4560 L=LEN(H$):FORT=1TOL:A$=MID$(H$,T,1):GOSUB750
4570 NEXTT
4580 RETURN
4590 IFSC$(X)=B$THEN4660
4600 A1=135:A2=152:A3=139:A4=160
4610 GOSUB4700
4620 GOSUB4500
4630 A1=8:A2=172:A3=12:A4=180:GOSUB4460
4640 A1=135:A2=172:A3=139:A4=180:GOSUB4530
4650 GOTO4030
```

Listing 1 continues

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3. capital loss and charity contribution carryforwards
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MONEY MANAGER—Personal bookkeeping system that allows the user to track and report on his income and expenses plus checking account, savings account and credit card balances. Separate reports for business and personal income and expenses.

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(with purchase of TB PLANNER)	$39
DEMO (TB PLANNER & MONEY MANAGER)	$ 7

✓53

Capital Software
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Listing 1 continued

```
4660 GOSUB4720:A1=135:A2=152:A3=139:A4=160:GOSUB4560
4670 A1=135:A2=172:A3=139:A4=180:GOSUB4530
4680 GOTO4090
4690 PUT(A1,A2)-(A3,A4),ZZ,PSET:A1=A1+2:A3=A3+2:PSET(A1,A4):PSET
(A1,A4-1):PSET(A1+1,A4):PSET(A1+1,A4-1):A1=A1-4:A3=A3-4:GOTO730
4700 PLAY"V30;T4;O2;L2;C;P255;L4;C;C;L2;C;L4;D#;L4;D;D;C;C;O1;B;
O2;L2;C;"
4710 RETURN
4720 PLAY"T2;V30;L8;O3;C;O2;A;L4;F;A;O3;C;L2;F;L8;A;G;L4;F;O2;A;
B;O3;L4;C;":RETURN
```

Program Listing 2. 16K Version

```
10 '          USA MAP
20 '
30 '     BY DENNIS H. WEIDE
40 '
50 '         (C) 1982
60 '
70 CLS:PRINT:PRINT:INPUT"1.STATES  2.CAPITALS";GS
80 PMODE 4,1:PCLS5:SCREEN1,1:COLOR0,1
90 LINE(0,0)-(255,191),PSET,B
100 LINE(135,142)-(135,192),PSET
110 LINE(0,142)-(255,142),PSET
120 LINE(0,166)-(255,166),PSET
130 LINE(34,4)-(42,16),PSET:DRAW"BM34,16;U12BR8D12BR4U12R8D8NL8D
4BR4U12R4ND8R4D12BR4NR8U4NR4U8R8"
140 IFGS=2THEN160
150 DRAW"BR7"
160 DRAW"BR12R4ND12R4BR4D12U4R8NU8D4BR4NR8U4NR4U8R8"
170 IFGS=2THEN210
180 DRAW"BR7"
190 DRAW"BR12BD12R8U4L8U8R8BR4R4ND12R4BR4ND12R8D8NL8D4BR8U12NL4R
4BR4NR8D8NR4D4R8BR4R8U4L8U8R8"
200 GOTO220
210 DRAW"BR12R8ND2L8D12R8NU2BR4U12R8D8NL8D4BR4U12R8D8L8U8R8BR4R2
NR2D12NL2R2BR8U12NL4R4BR4R8D12BL8U4NR8U8R8BR4D12R8BR4NU2R8U4L8U8
R8D2"
220 LINE(36,20)-(36,22),PSET
230 DATA6,34,22,36,34,36,41,33,47,32,64,35,75
240 GOSUB1020
250 DRAW"R2D2L2"
260 DATA7,41,89,45,90,54,101,54,103,64,103,77,107,87,107
270 GOSUB1020
280 DRAW"U1R5"
290 DATA42,97,112,97,115,103,117,104,115,109,116,116,125,124,128
,124,122,126,118,129,122,130,115,139,115,141,117,148,117
300 DATA145,113,156,112,160,114,163,112,167,118,167,121,171,127,
171,129,173,131,178,129,178,121,177,116,172,107,175,102,178,101,
179,98,191,85,189,75,193,77,194,75,194,72,197,72,200,65,198,64,1
99,61,197,59,207,56,212,53
310 GOSUB1020
320 DRAW"U2R2D1"
330 LINE-(215,51),PSET
340 DRAW"U2L2U1L2U6"
350 DATA12,220,40,221,35,218,34,218,26,215,27,210,25,207,35,204,
36,192,36,181,43,178,43,174,47
360 GOSUB1020
370 DRAW"R2D2L2"
380 DATA2,163,54,168,43,2,169,34,159,32,4,147,22,142,25,126,20,3
6,20,36,34,39,35
390 GOSUB1020
400 DRAW"U3R2D2R2U2"
410 GOSUB1020
420 DRAW"U7L4U2"
430 GOSUB1020:GOSUB1090
440 DRAW"D2"
450 DATA2,48,36,57,36,57,20,57,44,3,55,46,58,47,58,53
460 GOSUB1020:GOSUB1090:GOSUB1020
470 DATA2,32,54,75,54,49,54,49,72,4,65,87,67,90,64,93,64,103
480 GOSUB1060:GOSUB1020
490 DATA68,54,68,84,2,67,37,69,44,6,75,42,97,42,76,60,105,60,84,
60,84,107,68,81,127,81,105,60,105,81,102,81,102,104
500 GOSUB1090
510 DRAW"L3D3"
520 DRAW"BM62,20;D8R2D8"
530 GOSUB1020
540 DRAW"R7U2D2D16R21U40"
550 GOSUB1060
560 DATA2,92,104,92,106,102,84,112,84,4,112,93,119,96,131,96,133
,115,119,20,119,26
570 GOSUB1020:GOSUB1090:GOSUB1020
580 DRAW"BM127,81;D2R2D14"
```

Listing 2 continues

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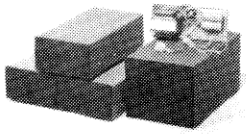

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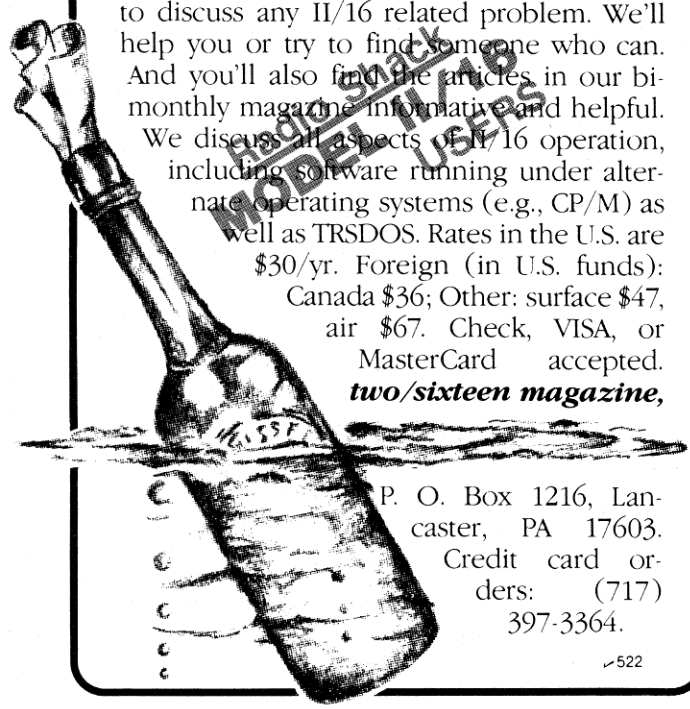

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Most microprocessors don't generate truly random numbers, and the Color Computer is no exception. At first, the program would always select the states in the same order. I found a very simple solution—human delay. I added the statement WW=RND(9999) to lines 690 and 3900. Each time the program scans the keyboard buffer for a key pressed, it must first generate a random number. If no key is pressed, then the line statement repeats. Since it is almost impossible for a person to respond with microsecond accuracy, the program executes these lines a different number of times on each pass.

Hints

The program must convert the keys pressed into graphics characters to be displayed on the hi-res screen. Therefore, use a moderate typing speed. If you make an error, just backspace to the incorrect character using the left arrow and retype from there.

The program will only recognize the letters A–Z, space bar, left arrow (for backspacing), break, enter, and period.

You must spell out names of the states completely (use North Carolina, not N. Carolina). Abbreviate Saint (use St. not Saint).

A 16K Version

The short program in Listing 2 (and Table 2) allows you to choose the game you wish to play and then draws the map for you. By using a lower graphics mode, you can save a lot of memory. (Table 3 shows the modes and how much memory each uses.) By leaving out the sound and graphics text, you should be able to write a workable program using this map. The map will be drawn much slower because the program must read data statements for each line statement, but you can probably live with that. ■

Dennis Weide can be reached at 14201 Marquette NE, Albuquerque, NM 87123.

Command	PMODE	Free Memory
PCLEAR1	0,1	9067
PCLEAR2	2,1	7531
PCLEAR4	4,1	4459

Note: PMODE 4,1 works best. PMODE 2,1 is very good and PMODE 0,1 is acceptable.

Table 3. PMODEs

Listing 2 continued

```
590 GOSUB1090
600 DATA3,121,29,118,37,97,37,118,37,121,40,5,121,54,118,53,117,
54,115,53,97,53,121,53,123,56,4,122,62,125,66,127,69,127,81
610 GOSUB1020:GOSUB1090:GOSUB1020:GOSUB1090:GOSUB1020
620 DATA2,105,66,125,66,143,25,136,32,3,134,40,137,51,148,51,2,1
21,48,135,48,138,51,141,57,2,137,65,124,65,149,51,150,53
630 GOSUB1060
640 DRAW"D2L2"
650 GOSUB1020
660 DRAW"D1R2"
670 GOSUB1060:GOSUB1020:GOSUB1090
680 DATA5,151,56,151,70,149,73,145,75,143,78,137,65,145,81,142,8
4,137,97,137,97,139,100,4,138,103,140,108,144,108,145,113,2,139,
90,168,90,149,90,148,112,158,90
690 GOSUB1020:GOSUB1090
700 DRAW"D3L3U2L14"
710 GOSUB1090
720 DRAW"D1L6"
730 GOSUB1090:GOSUB1020:GOSUB1060
740 DRAW"R4U4R8"
750 GOSUB1050
760 DRAW"BM159,109;R9U1R4"
770 DATA173,104,168,93,169,89,180,90,183,93,158,90,160,87,2,163,
87,168,82,149,73,150,74,4,153,72,154,72,160,69,160,54,160,67,161
,69,10,162,68,165,70,170,78,173,78,174,74,177,73,178,72,181,71,1
87,72,189,77
780 GOSUB1090
790 DRAW"D1L2"
800 GOSUB1050
810 DRAW"R5D1R6"
820 GOSUB1090
830 DRAW"BM144,83;R4U1R41"
840 GOSUB1090:GOSUB1020:GOSUB1090
850 GOSUB1020:GOSUB1090:GOSUB1020
860 DATA2,163,81,168,78,136,31,140,30,6,144,34,146,34,148,40,151
,38,149,44,148,51,142,31,150,27,7,149,30,152,31,156,29,159,33,15
5,34,150,35,149,39,159,33,155,37,3,153,43,153,47,150,53,157,35,1
61,37
870 GOSUB1060:GOSUB1020:GOSUB1090
880 GOSUB1020:GOSUB1090:GOSUB1020:GOSUB1090
890 DRAW"D7R2U3"
900 DATA2,165,42,166,47,150,54,169,54,4,176,50,176,47,183,44,184
,42,172,52,172,68,3,191,68,194,69,194,72,172,64,169,67,164,70,19
3,58,192,58,191,63,2,193,64,191,68,197,51,209,51,210,54
910 GOSUB1020:GOSUB1090:GOSUB1020:GOSUB1090:GOSUB1020
920 DRAW"BM189,68;D3R6"
930 GOSUB1090:GOSUB1050
940 DRAW"BM175,68;D4R5"
950 DRAW"BM175,51;D4R13"
960 GOSUB1050
970 DRAW"R4U9R2U12"
980 GOSUB1090:GOSUB1020:GOSUB1090:GOSUB1050:GOSUB1060:GOSUB1050
990 DATA2,205,51,205,57,199,46,207,47,210,44,204,36,205,39,2,203
,43,203,47,209,32,208,35,2,209,43,210,43,202,60,209,58,3,210,60,
206,61,202,60
1000 GOSUB1090:GOSUB1020:GOSUB1090:GOSUB1020:GOSUB1090:GOSUB1020
1010 GOTO1010
1020 READA
1030 FORX=1TO A:READB,C
1040 LINE-(B,C),PSET:NEXTX:RETURN
1050 READA,B:LINE-(A,B),PSET:RETURN
1060 READA
1070 FORX=1TO A:READB,C,D,E
1080 LINE(B,C)-(D,E),PSET:NEXTX:RETURN
1090 READA,B,C,D:LINE(A,B)-(C,D),PSET:RETURN
```

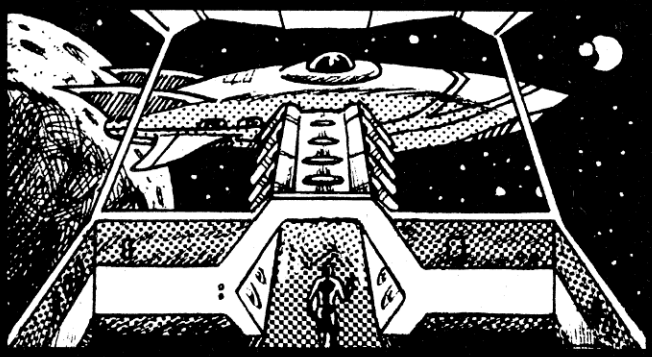
Line Numbers	Function
70	Chooses whether you name states or capitals
80	Selects hi-res graphics mode
90–130	Draws screen border and boxes
140	Selects screen title
150–220	Completes title on screen
230–1000	Draws map of U.S.A.
1010	Keeps map on screen-delete when using map in program
1020–1040	Subroutine for LINE(x,y) (multiple statements)
1050	Subroutine for LINE(x,y) (single statements)
1060–1080	Subroutine for LINE(a,b)–(c,d) (multiple statements)
1090	Subroutine for LINE(a,b)–(c,d) (single statements)

Table 2. Map Line Description

THE COLORQUEST EXPERIENCE

For the TRS-80C and the TDP System 100 Color Computers

Written by Kevin Herrboldt & Tim Nelson



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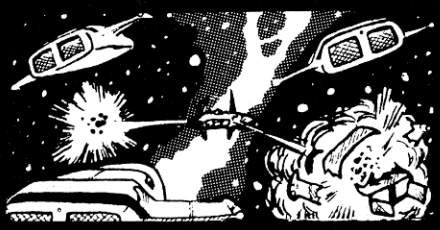

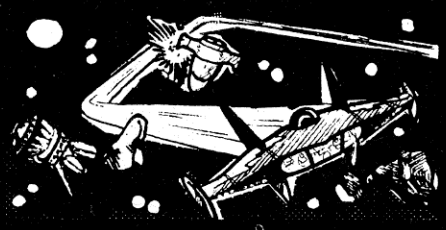

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Spelling Challenger

by Larry Krengel

Use these three word games—Scrambler, Three Strikes, and Synonyms—to help your children memorize their spelling words each week.

You'd think that a spelling test would be easy to prepare for. After all, the student only has to memorize a list and repeat it on command.

But it isn't as easy as it sounds. So when the teacher assigned my daughters 20 words a week for the entire school year, I wrote a program to make studying more enticing—enticing enough, I hoped, to beget good grades.

Spelling Challenger is actually three programs. The first scrambles a series of words and then presents them randomly. The child can either play it on the screen or from a printout.

The second, called Three Strikes, presents a word in which the letters have been replaced by asterisks. The task is to guess the letters. Three wrong guesses and you're out.

The third is a synonym quiz. You enter a list of synonyms along with the original spelling list. The child's job is to match the properly spelled word with its synonym.

I developed Spelling Challenger to take advantage of my Exatron Stringy-Floppy's @FREEZE option. Later, I added the option of storing data on tape. You can use the original (and shorter) ESF version by deleting lines 665, 667, 735, 737, and 7000–8080. If you're using a Model I with disks, add 10 CMD"T". ■

Larry Krengel can be reached at P.O. Box 94, Elmhurst, IL 60126.

Program Listing

```
100 REM ****************************
110 REM *                          *
120 REM *    SPELLING CHALLENGER   *
130 REM *           3/82           *
140 REM *     BY LARRY KRENGEL     *
150 REM *                          *
160 REM * TRS-80 MODEL I  LEVEL II *
170 REM *                          *
180 REM ****************************
400 CLEAR10000
500 DIM W$(25),S$(25),C(25),WC(25)
520 FORX=1TO10:READW$(X):NEXT:FORX=1TO10:READ S$(X):NEXT
530 DATA FURNISH,TIMBER,SUPPORT,COUNCIL,PORTABLE,FEVER,OBJECT,AU
TOMATIC,COMMAND,VARIOUS
540 DATA TO PROVIDE,LUMBER OR TREES,TO HOLD UP,A GROUP OF DELEGA
TES,MOVABLE,HIGH BODY TEMPERATURE,TO OPPOSE,SELF-WORKING,TELL WH
AT TO DO,DIFFERENT KINDS
550 N=10
590 ON ERROR GOTO6500
600 CLS: PRINTTAB(12)">>>> SPELLING CHALLENGER <<<<":PRINT:PRINT

610 PRINT"1- enter/change words"
620 PRINT"2- missing letter"
630 PRINT"3- synonyms"
640 PRINT"4- 3 strikes"
650 PRINT"5- scramble"
660 PRINT"6- @FREEZE"
665 PRINT"7- save words on tape"
667 PRINT"8- read words from tape"
670 A$="":A$=INKEY$
680 IFA$="1"GOTO1000
690 IFA$="2"GOTO2000
700 IFA$="3"GOTO3000
710 IFA$="4"GOTO4000
720 IFA$="5"GOTO5000
730 IFA$="6"GOTO6000
735 IFA$="7"GOTO7000
737 IFA$="8"GOTO8000
```

Listing continues

The Key Box

Model I or III
16K RAM, 48K RAM
Cassette or Disk Basic
Printer (optional)
Exatron Stringy-Floppy (optional)

Listing continued

```
740 GOTO670
1000 REM ### enter/correct words ###
1010 FORX=1TO25
1020 CLS:IFW$(X)=""GOTO1090
1030 IFW$(X)<>""PRINT"The #";X;"word is ";W$(X);"."ELSE GOTO1090

1040 INPUT"Enter change if you wish.  ";W$(X)
1050 PRINT:IFS$(X)<>""PRINT"A synonym for ";W$(X);" is ";S$(X);"
."ELSEINPUT"Enter synonym - ";S$(X):GOTO1070
1060 INPUT"Enter new synonym if you wish - ";S$(X)
1080 GOTO1110
1090 PRINT"Enter word ";X;" (''=menu) - ";:INPUTW$(X):IFW$(X)=""
GOTO1120
1100 INPUT"Enter synonym - ";S$(X)
1110 NEXTX
1120 N=0:FORX=1TO25:IFW$(X)<>""N=N+1:NEXT
1130 GOTO600
2000 REM ### missing letter ###
2010 CLS:RANDOM
2020 W=RND(25):IFW$(W)=""GOTO2020
2030 L=LEN(W$(W))
2040 K=RND(L)
2050 FORX=1TOL
2060 IFX=KPRINT"(-)";:GOTO2080
2070 PRINTMID$(W$(W),X,1);
2080 NEXTX
2090 PRINT:PRINT"enter missing letter -";
2100 A$="":A$=INKEY$
2110 IF(A$<>MID$(W$(W),K,1))AND(A$<>"")PRINT"BOO !!! NO...":FORX
=1TO1000:NEXT:CLS:GOTO2050
2120 IFA$=MID$(W$(W),K,1)PRINT"VERY GOOD !!!":FORX=1TO1000:NEXT:
GOTO2140
2130 GOTO2100
2140 PRINT:PRINT"Do you wish another missing letter? y/n";
2150 A$="":A$=INKEY$
2160 IF(A$="n")OR(A$="N")GOTO600
2170 IF(A$="y")OR(A$="Y")GOTO2010
2180 GOTO2150
3000 REM ### synonym ###
3010 CLS:RANDOM
3020 RANDOM:X=RND(N):T=0
3030 PRINTTAB(10)"Synonym spelling practice"
3040 PRINT:PRINT"Write the spelling word that means -  ";S$(X)
3050 PRINT:PRINTTAB(10)">>>";:INPUTG$
3060 IFG$=W$(X)PRINT"That is correct...":GOTO3100
3070 IFT=2:CLS:PRINT:PRINT"The correct answer is ";W$(X);".":GOT
O3100
3080 PRINT:PRINT"No... Try again.":T=T+1:GOTO3050
3100 PRINT:PRINT"do you want another synonym?"
3110 A$="":A$=INKEY$
3120 IF(A$="y")OR(A$="Y")GOTO3010
3130 IF(A$="n")OR(A$="N")GOTO600
3140 GOTO3110
4000 REM ### three strikes ###
4010 CLS:RANDOM:X=RND(N)
4020 L=LEN(W$(X)):GC=0:C=1:T$=W$(X)
```

Listing continues

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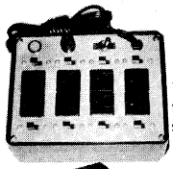

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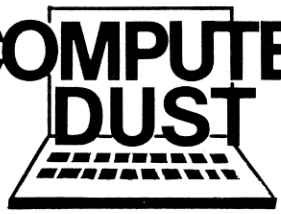

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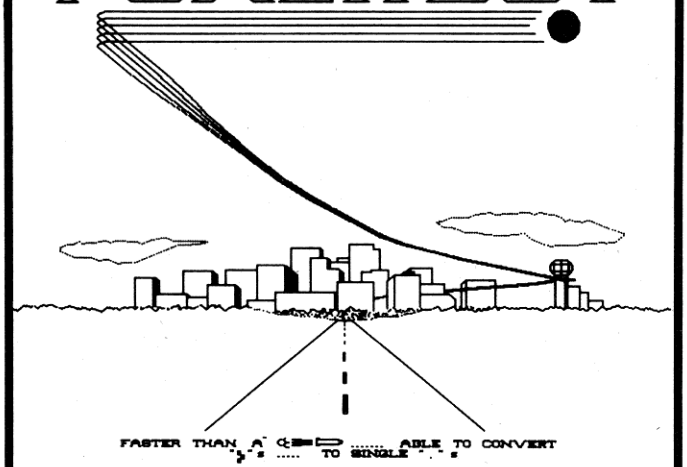
Listing continued

```
4030 PRINTTAB(20)"*** 1 - 2 - 3  STRIKES  ***"
4040 S=(480-L):FORY=STO(S+2*L)-1STEP2:PRINT@Y,"*":NEXT
4050 PRINT@602,L;" letters"
4060 PRINT@716,"make a guess - ":A=735
4070 G$="":G$=INKEY$:IFG$=""GOTO4070
4080 PRINT@A,G$:T=0
4090 FORY=1TOL:IFG$=MID$(T$,Y,1)PRINT@(S+2*(Y-1)),G$:T=1:C=C+1:T
$=LEFT$(T$,Y-1)+"!"+RIGHT$(T$,L-Y)
4100 NEXT
4110 IFT=0:GC=GC+1:PRINT@923,"STRIKE";GC
4120 IFGC=3:PRINT@832,"YOU LOSE!!!  The word was ";W$(X):GOTO415
0
4130 IFC=L+1:PRINT@832,"YOU WIN!!!":GOTO4150
4140 A=A+2:PRINT@A+1," ";:GOTO4070
4150 PRINT"do you wish another word?"
4160 A$="":A$=INKEY$
4170 IF(A$="y")OR(A$="Y")GOTO4010
4180 IF(A$="n")OR(A$="N")GOTO600
4190 GOTO4160
5000 REM ### scramble ###
5010 CLS:RANDOM
5020 PRINT"do you wish the scrambled words on a printer?"
5030 A$="":A$=INKEY$
5040 IF(A$="y")OR(A$="Y")LP=1:GOTO5070
5050 IF(A$="n")OR(A$="N")LP=0:GOTO5070
5060 GOTO5030
5070 IFLP=1:INPUT"Enter when the printer is ready.";W$:LPRINTCHR
$(14)TAB(4)"** SCRAMBLED SPELLING WORDS **"CHR$(10)
5080 CLS:FORX=1TON:C(X)=0:NEXT:C(0)=1
5090 FORNS=1TON
5100 RANDOM:X=RND(N):IFC(X)=1GOTO5100
5110 C(X)=1
5120 L=LEN(W$(X)):SW$=""
5130 FORY=1TOL:WC(Y)=0:NEXT
5140 Y=RND(L):IFWC(Y)=1GOTO5140
5150 WC(Y)=1
5160 SW$=SW$+MID$(W$(X),Y,1)
5170 IFLEN(SW$)<>LEN(W$(X))GOTO5140
5180 IFLP=1LPRINTTAB(15)NS;SW$;TAB(35)STRING$(15,".")CHR$(10):GO
TO5320
5190 CLS:T=1:PRINTTAB(20)"SCRAMBLE":PRINTTAB(15)"enter 'G' if yo
u give up"
5200 PRINT:PRINTT,SW$
5210 A$="":PRINT:INPUT"enter unscrambled word - ";A$
5220 IF(A$="G")OR(A$="g"):CLS:FORF=1TO6:PRINT@725,W$(X):PRINT@72
5,STRING$(20," "):FORE=1TO50:NEXTE:NEXTF:PRINT@725,W$(X):GOTO527
0
5230 IFA$<>W$(X):T=T+1
5240 IFT=4A$="g":GOTO5220
5250 IFA$=W$(X)PRINT:PRINT"good job!!!":GOTO5270
5260 GOTO5200
5270 PRINT:PRINT"Want to try another?"
5280 A$="":A$=INKEY$
5290 IF(A$="y")OR(A$="Y")GOTO5320
5300 IF(A$="n")OR(A$="N")GOTO600
5310 GOTO5280
5320 NEXTNS
5330 CLS:INPUT"you have completed the entire list of words...";W
$:GOTO600
6000 REM ### @FREEZE ###
6010 CLS
6020 INPUT"Has the @FREEZE program been loaded?";A$
6030 IF(LEFT$(A$,1)<>"y")AND(LEFT$(A$,1)<>"Y"):GOTO600
6040 INPUT"enter file number when wafer is ready...";F
6050 @FREEZEF
6060 GOTO600
6500 PRINT"an error has been encountered - has @FREEZE really be
en loaded?":INPUTW$:GOTO600
7000 REM ### SAVE ON TAPE ###
7010 CLS:W$=""
7020 INPUT"ENTER WHEN TAPE IS READY (E=ESCAPE)";W$
7030 IFW$="E"GOTO600
7040 FORX=1TO25
7050 PRINT#-1,W$(X),S$(X)
7060 IFW$(X+1)=""PRINT#-1,"XX","XX":GOTO600
7070 NEXT
7080 GOTO600
8000 REM ### READ FROM TAPE ###
8010 CLS:W$=""
8020 INPUT"ENTER WHEN TAPE IS READY (E=ESCAPE)";W$
8030 IFW$="E"GOTO600
8040 FORX=1TO25
8050 INPUT#-1,W$(X),S$(X)
8060 IFW$(X)="XX"W$(X)="":S$(X)="":GOTO600
8070 NEXT
```

ITS A BIRD .... ITS A PLANE ..... ITS .....

POWERDOT



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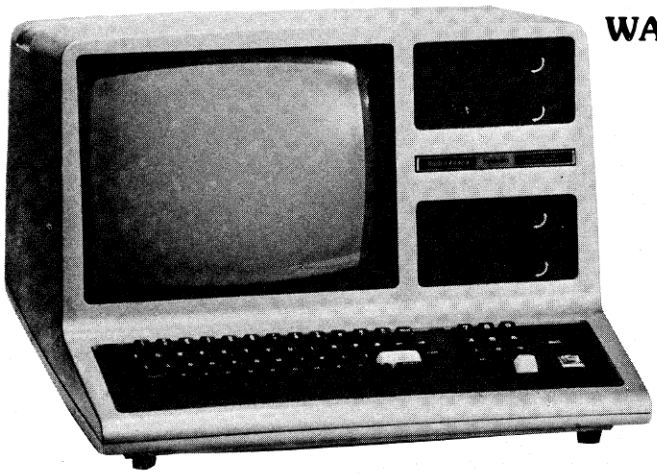

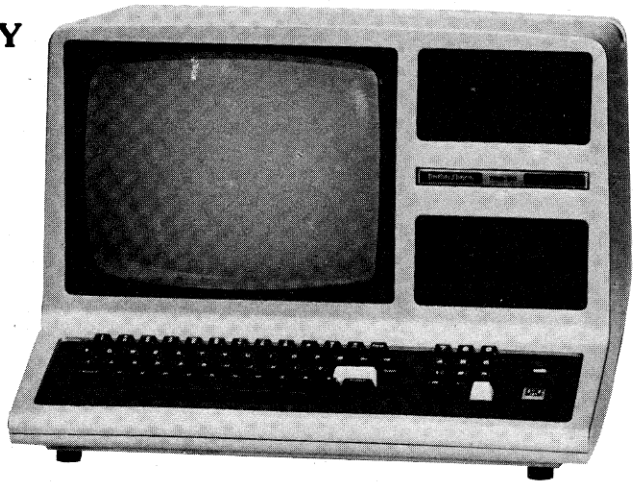

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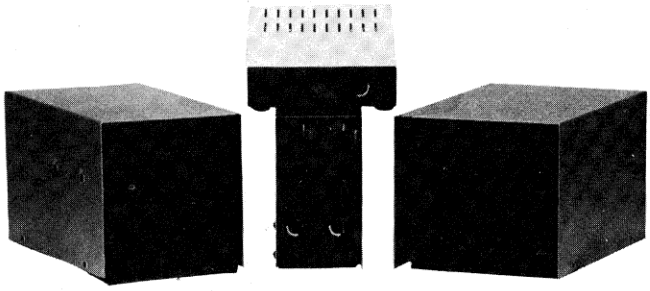

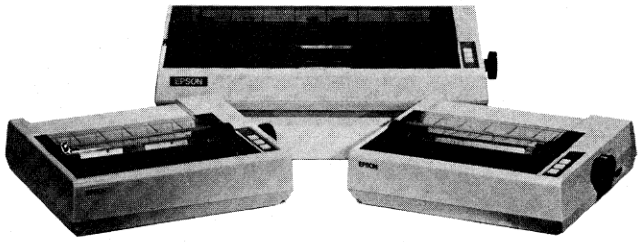

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Math Fun

by David Haan

Your children will have so much fun playing with your micro that they won't even notice they're learning addition and subtraction.

My 5-year old is very interested in simple arithmetic, and even more interested in my TRS-80. It seemed only reasonable to satisfy both his interests by letting him learn arithmetic on the computer.

The Basic and Assembly programs in Listings 1 and 2 form an exercise drill my son can use on his own (after I load it). The Basic program generates the random problems, sets limits of difficulty, checks answers, and keeps score. The Assembly-language program displays problems in large block letters, produces graphics displays, and plays sound routines.

Although I wrote these programs to run on a Model III disk system with 48K RAM, I've included a version that runs on a 16K Model III tape system.

The Assembly-Language Program

The Assembly-language routine is made up of five USR functions and a data base.

The first USR function, USR0, fills a 400H-byte local buffer with blanks. USR2 will use this blank area later to clear the screen.

USR1 puts the messages LEVEL= and + − ×/= on the screen in block letters. Two portions of the data base, starting at the labels LVLSTR and OPRSTR, move to the CRT memory to produce these letters. The LEVEL= message asks for the difficulty of the problems, and the + − ×/= message asks for the type of math operation.

USR2 is executed in response to a correct or incorrect answer. When the student enters the correct answer to a problem, this USR saves the contents of the CRT memory (after the Basic program generates a random graphics pattern). Then the routine moves the blank area produced by USR0 to the CRT memory. This clears out the screen. After a short delay, the random pattern is put back into the CRT memory. This process of flashing the random pattern on the screen is repeated eight times, followed by a musical tune. The musical tune indicating a correct answer is part of the data base starting at SNDBFW.

If the answer to the problem is incorrect, the routine plays a tune starting at

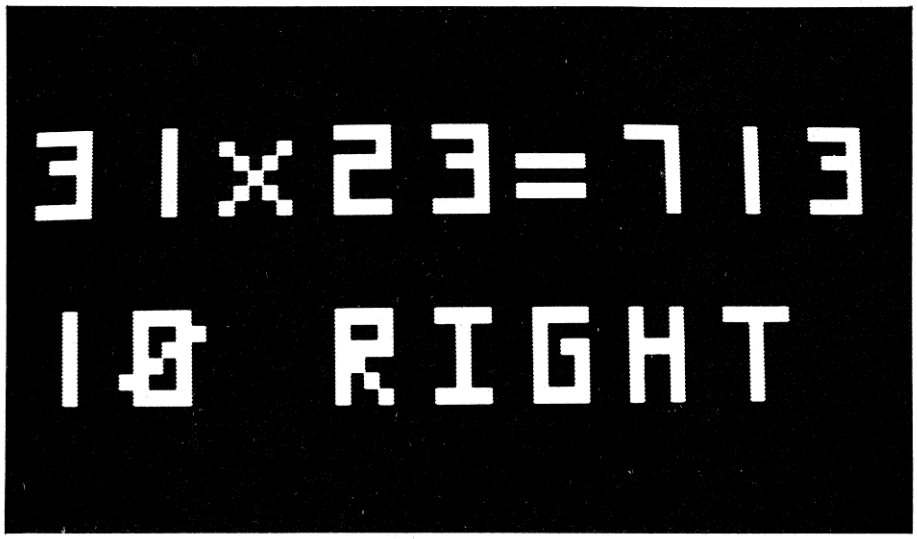

Photo 1

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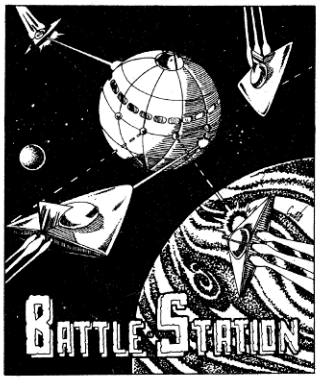

(DV 1982) Blurry eyed users have turned to **DISPLAYED VIDEO** to answer their need for new and exciting arcade games. In response, **DISPLAYED VIDEO** has announced eight new programs for the TRS-80* Models I-III. These arcade type games feature sound, graphics, joystick compatibility and are written in machine language for maximum speed! Both disk and tape versions allow the user to save high scores, a feature not usually found on cassette based games. Maze enthusiasts seem to like Ghost Hunter and Killer Beetles, while gun slingers look toward Insect Frenzy, Jungle Raiders, Space Shootout, Alien Cresta and Battle Stations for excitement. A Game that does not fall into these categories is Hoppy. It features wild drivers, sinking turtles, and hungry alligators. These programs are distributed exclusively by **DISPLAYED VIDEO** and written by Dubois and McNamara. Pricing for these programs is **$15.95** for tape and **$19.95** for disk. Reliable sources inside the company indicate Killer Gorilla will be available by the time you read this.

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SNDBFL. The storage location WINLOS is used to tell USR2 whether the screen is to be flashed, and which tune is to be played. If the student's answer is correct, 1 is POKEd from Basic into the location WINLOS. If the answer is wrong, a 0 is POKEd into this location. USR2 tests this flag to determine which routine it should execute.

The next USR function is USR3. When 10 problems have been answered either correctly or incorrectly, USR3 puts the word RIGHT in block letters on the bottom of the screen. Basic then calls USR4 to display the number of correctly answered problems (see photo).

USR4 is the routine used most often. Its function is to display in block letters the numbers 0–9 and the symbols for addition, subtraction, multiplication, division, an equal sign, a question mark, and a blank at the correct locations on the CRT.

This routine uses two storage locations into which the Basic program POKEs data. The first of these two locations is PNTLOC, where Basic POKEs an index into a table called LOCTBL. LOCTBL contains addresses of different locations on the CRT. The second storage location, NUMBER, is where the Basic program stores a number used by USR4 as an index into a table called NUMTBL. Each 16-bit entry in NUMTBL points to the data-base address where the character to be displayed starts. Using these two locations, the desired character is put into the correct area of the CRT memory. The photo shows a problem displayed using USR4.

The Basic Program

The Basic program that calls each of these USR functions is shown in Listing 1.

Lines 140–220 perform initialization and setup. This portion defines the addresses of the entry points of each USR, loads the Assembly program, and defines the addresses of PNTLOC, NUMBER, and WINLOS. This portion also initializes the 400H-byte buffer of blanks via USR0. The variable LO defines the address of PNTLOC, VA defines the address of NUMBER, and WI defines the address of WINLOS.

"To hear the sound, I recommend the audio amplifier sold by Radio Shack."

In lines 280–410, the LEVEL= and + − ×/= questions are displayed by calling USR1. Then a subroutine at line 1870, via USR4, flashes a question mark behind each question. You can answer either question first. The LEVEL= question accepts a difficulty factor from one to four. The shift key is not required to indicate the math operation required, since the program checks for the unshifted value of the key, where necessary.

To put a question mark (or for that matter, any valid character) in the correct screen position, the index corresponding to the character to be displayed is POKEd into NUMBER via POKE VA,15 (15 is the index for the character ?—see NUMTBL in Listing 2). To specify the CRT location where this character is to be displayed, an index value is POKEd into location PNTLOC via a POKE LO,0. An index of 0 indicates the CRT display location behind the question LEVEL= (see LOCTBL in Listing 2). The messages LEVEL=, + − ×/=, and RIGHT are coded to be displayed at specific locations.

The third part of the Basic program, lines 470–810, uses the difficulty level and the type of math function desired to generate and display a random problem. Once the elements of the problem have been determined based on the difficulty desired (lines 470–680), the problem is displayed (lines 690–810).

The fourth part of the program looks for and checks answers (lines 870–1150). Since I used the INKEY$ function, you need not press the enter key. Simply type in the number or character desired. Each digit of the answer is checked as it is entered. If it is incorrect, the error subroutine at line 1650 POKEs a 0 into WINLOS and USR2 is called to play a tune indicating an error. The student is then given another chance on the same problem. If he enters three wrong answers, lines 1740–1810 display the correct value. The program generates a new problem if this was not the tenth problem.

The fifth part of the Basic code generates the random graphics pattern and musical tune if the answer is correct (lines 1210–1400). Once the graphics pattern is finished, a value of 1 is POKEd into location WINLOS and USR2 is executed to generate the musical tune.

The sixth and last part (lines 1460–1590) tests to see if 10 problems have been answered. If so, the word RIGHT is displayed on the bottom of the CRT (see photo), and the number of problems answered correctly on the first try is flashed on the screen. Then, the whole process starts over at line 280, allowing a new level of difficulty or a different math function.

Tape-System Modifications

In the Basic program, replace lines 10–210 of Listing 1 with lines 10–210 of Listing 3. Depending on the size of your computer memory, you will have to assemble the Assembly program at a different origin address to stay within the confines of your RAM. Also, remember to redefine the locations in lines 180–210 of Listing 3 appropriately.

Notes	Frequency (Hz)	Hex Value
Middle C	261.6	FE
C Sharp	277.2	F0
D	293.7	E0
D Sharp	311.1	D5
E	329.6	C6
F	349.2	BC
F Sharp	370.0	B3
G	392.0	A6
G Sharp	415.3	9C
A	440.0	92
A Sharp	466.2	8D
B	493.8	86
C	523.2	7C
C Sharp	554.4	73
D	587.4	6C
D Sharp	622.2	65
E	659.2	5F
F	698.4	59
F Sharp	740.0	54
G	784.0	4F
G Sharp	830.6	4B

Table 1. Music Parameters

The only other change you need make to the Basic program is in the USR calls. Since a tape system has only one USR function, all the USR calls have to go to the same address. To ensure the correct USR function is executed, I added a new assembly location, as defined by variable RO in line 180 of Listing 3. Each USR call in Listing 1 has to be changed to use this location as follows:

When a USR call in Listing 1 says X=USRz(A), replace it with POKE RO,z:X=USR(A), where z is the USR number used in the disk version of Listing 1. For example, you'd rewrite X=USR4(A) as POKE RO,4:X=USR(A).

As far as the Assembly program is concerned, the code in Listing 4 must replace lines 10–60 of the code in Listing 2. Location ROUTIN is where the POKE RO,z will place the number of the USR you wish to execute. Again, make sure your Basic program has defined the variables in lines 180–210 correctly. (Your Basic manual will tell you how under the section discussing the POKE.)

Program Execution

To run the programs, set memory size as determined by where you placed the Assembly code. If you have a disk system, just run the Basic program. If you are using a tape system, load the object code of the Assembly program, then the Basic program, and run. To hear the sound, I recommend the audio amplifier sold by Radio Shack. Plug the cassette port output jack into the amplifier input.

Changing Your Tune

Table 1 lists the parameters needed to generate the music. You can change the tune played by putting the hex value for the notes you want in the least-significant byte of a word. The note duration is in the most-significant byte of the same word. You calculate the duration by taking the frequency of the note in Hz and dividing that by the length in seconds of the duration desired. If you want to play an A above middle C for ¼ second, divide its frequency (440 Hz) by 4, and place the resulting value in the high-order byte.

To see how this is done, look at the first three notes (G, E, middle C) shown in lines 5980–6030 of Listing 2. The hex value for G (A6) is placed in the low-order byte of the first word in line 5980. The hex value for E (C6) is placed in the low-order byte of the third word in line 6000. Finally the hex value of C (FE) is placed in the low-order byte of the fifth word in line 6020. The duration of each note is placed in the high-order bytes in lines 5980, 6000 and 6020. The data in lines 5990, 6010, and 6030 are short delays to separate the notes.

Well, that's it. Try the program, and make whatever changes you want to the limits of difficulty or the tune the program plays. ■

David Haan can be reached at 4361 S. Estes St., Littleton, CO 80123.

Program Listing 1. Basic Program

```
10 REM VARIABLE LO DEFINES ASSEMBLY LOCATION 'PNTLOC'
20 REM VARIABLE VA DEFINES ASSEMBLY LOCATION 'NUMBER'
30 REM VARIABLE WI DEFINES ASSEMBLY LOCATION 'WINLOS'
40 REM USR(0) INITIALIZE BUFFER IN ASSEMBLY ROUTINE
50 REM USR(1) PRINTS "LEVEL=" AND "+-x/ ="
60 REM USR(2) CORRECT ANSWER ROUTINE
70 REM USR(3) PRINT "RIGHT"
80 REM USR(4) PRINTS A NUMBER OR CHARACTER OF THE CRT
90 REM
100 REM*********************************************************
110 REM              INITIALIZATION AND SETUP
120 REM*********************************************************
130 REM
140 CLS:DEFINT A,F,H,I,L,N,O,P,Q,R,T,V,W,X,Y,Z
150 DEFUSR0=&HF207:DEFUSR1=&HF220
160 DEFUSR2=&HF23D:DEFUSR3=&HF2DE
170 DEFUSR4=&HF2F0
180 CMD"L","PRESKOOL/CMD"
190 LO=&HF201
200 VA=&HF202
210 WI=&HF200
220 X=USR0(A)
230 REM
240 REM*********************************************************
250 REM              DISPLAYS "LEVEL=" AND "+-x/ ="
260 REM*********************************************************
270 REM
280 L=0:F=0:X=USR1(A)
290 GOSUB 1870
300 IF L>0 GOTO 340
310 L =VAL(A$)
320 IF L=>1 AND L=<4 GOTO 330  ELSE L=0:GOTO 340
330 POKE LO,0:POKE VA,L:X=USR4(A):GOTO340
340 IF F>0 GOTO 410
350 IF A$="+" OR A$=";" THEN F=1:O=10:GOTO400
360 IF A$="-" THEN F=2:O=11:GOTO400
370 IF A$="X" OR A$="x" THEN F=3:O=12:GOTO400
380 IF A$="/" THEN F=4:O=13:GOTO400
390 GOTO 290
400 POKE LO,1:POKE VA,O:X=USR4(A)
410 IF L=0 GOTO 290
420 REM
430 REM*********************************************************
440 REM              GENERATE AND DISPLAY PROBLEM
450 REM*********************************************************
460 REM
470 ON L GOTO 480  ,490  ,500  ,510
480 RV=11:GOTO 530
490 RV=21:GOTO 530
500 RV=51:GOTO 530
510 RV=100
520 RANDOM
530 R1=RND(RV)
540 IF R1=RV THEN R1=0
550 R2=RND(RV)
560 IF R2=RV THEN R2=0
570 IF F>2 THEN R1=INT(R1/3):R2=INT(R2/3)
580 ON F GOTO 590  ,610  ,620  ,650
590 IF L=1 THEN L1=10 ELSE L1=999
600 V=R1+R2:IF V>L1 GOTO 530  ELSE 690
610 V=R1-R2:IF V<0 GOTO 530  ELSE 690
620 IF L=1 THEN L1=10 ELSE L1=L*25-1
630 IF L=4 THEN L1=999
640 V=R1*R2:IF V>L1 GOTO 530  ELSE 690
650 IF L=1 THEN L1=10 ELSE L1=L*25-1
660 IF L=4 THEN L1=99
670 IF R2=0 GOTO 530
680 V=R1*R2:IF V>L1 GOTO 530  ELSE V1=R1:N1=V:V=V1:R1=N1
690 N1=INT(R1/10):POKE LO,2:IF N1<1 THEN POKE VA,16:X=USR4(A):N2
=R1:GOTO710  ELSE POKE VA,N1:X=USR4(A)
700 N2=R1-10*N1
710 POKE LO,3:POKE VA,N2:X=USR4(A)
720 POKE LO,4:ON F GOTO 730  ,740  ,750  ,760
730 POKE VA,10:GOTO 770
```

Listing 1 continues

Listing 1 continued

```
740 POKE VA,11:GOTO 770
750 POKE VA,12:GOTO 770
760 POKE VA,13
770 X=USR4(A)
780 N3=INT(R2/10):POKE LO,5:IF N3<1 THEN POKE VA,16:X=USR4(A):N4
=R2:GOTO800  ELSE POKE VA,N3:X=USR4(A)
790 N4=R2-10*N3
800 POKE LO,6:POKE VA,N4:X=USR4(A)
810 POKE LO,7:POKE VA,14:X=USR4(A)
820 REM
830 REM*********************************************************
840 REM              LOOK FOR/AND CHECK ANSWER
850 REM*********************************************************
860 REM
870 POKE LO,8
880 GOSUB 1870
890 VH=VAL(A$)
900 IF V<10 GOTO 930
910 IF V<100 GOTO 950
920 GOTO 1030
930 IF VH=V POKE VA,VH:X=USR4(A):GOTO 1210 ELSE GOSUB 1650
940 IF TR=3 GOTO 1740 ELSE 870
950 IF VH=INT(V/10)GOTO 970  ELSE GOSUB 1650
960 IF TR=3 GOTO 1740 ELSE 870
970 POKE VA,VH:X=USR4(A)
980 POKE LO,9:GOSUB 1870
990 VT=VAL(A$)
1000 IF VT= V-10*INT(V/10) GOTO 1020 ELSE GOSUB 1650
1010 IF TR=3 THEN GOTO 1740 ELSE 980
1020 POKE VA,VT:X=USR4(A):GOTO 1210
1030 IF VH=INT(V/100)GOTO 1050 ELSE GOSUB1650
1040 IF TR=3 GOTO1740 ELSE 870
1050 POKE VA,VH:X=USR4(A)
1060 POKE LO,9:GOSUB 1870
1070 VT=VAL(A$)
1080 V1=V-100*INT(V/100):IF VT=INT(V1/10) GOTO 1100 ELSE GOSUB 1
650
1090 IF TR=3 GOTO 1740 ELSE 1060
1100 POKE VA,VT:X=USR4(A)
1110 POKE LO,10:GOSUB 1870
1120 VO=VAL(A$)
1130 V1=V-100*INT(V/100):V2=V1-10*INT(V1/10):IF VO=V2 GOTO 1150
ELSE GOSUB 1650
1140 IF TR=3 GOTO1740 ELSE 1110
1150 POKE VA,VO:X=USR4(A):GOTO 1210
1160 REM
1170 REM*********************************************************
1180 REM          RANDOM PATERN AND MUSIC FOR CORRECT ANSWER
1190 REM*********************************************************
1200 REM
1210 IF TR=0 THEN NR=NR+1:NT=NT+1
1220 FOR I=1 TO 200: NEXT I
1230 CLS:PRINT CHR$(21)
1240 PRINT @991,CHR$(255)
1250 FOR I=1TO 6
1260 FOR X=1 TO 40
1270 NEXT X
1280 PRINT
1290 NEXT I
1300 PRINT CHR$(21)
1310 CLS:H=0:V=0
1320 FOR P=1 TO 7
1330 H=H+5:V=V+2
1340 FOR I=1 TO 10
1350 X=RND(H):Q=-X:X=X+64:Y=RND(V):Z=-Y:Y=Y+23
1360 SET (X,Y):SET(Q+64,Z+23):SET(X,Z+23):SET(Q+64,Y)
1370 NEXT I
1380 NEXT P
1390 POKE WI,1
1400 X=USR2(A)
1410 REM
1420 REM*********************************************************
1430 REM     TEST IF SESSION DONE / DISPLAY NUMBER CORRECT
1440 REM*********************************************************
1450 REM
1460 IF NT=10 THEN X=USR3(A):GOTO1470 ELSE CLS:TR=0:GOTO 470
1470 FOR Z=1 TO 5
1480 POKE LO,11:POKE VA,16:X=USR4(A):POKE LO,12:X=USR4(A)
1490 GOSUB 1570
1500 POKE LO,11:IF NR=10 POKE VA,1:X=USR4(A):POKE LO,12:POKE VA,
0:X=USR4(A):GOTO 1520
1510 POKE LO,12:POKE VA,NR:X=USR4(A)
1520 GOSUB 1570
1530 NEXT Z
1540 NR=0:NT=0:TR=0
1550 FOR I=1 TO 1000
1560 NEXT I:CLS:GOTO280
1570 FOR I=1 TO 50
1580 NEXT I
1590 RETURN
1600 REM
1610 REM*********************************************************
1620 REM              PLAY TUNE INDICATING WRONG ANSWER
1630 REM*********************************************************
1640 REM
1650 TR=TR+1:IF TR=1 THEN NT=NT+1
1660 POKE WI,0
1670 X=USR2(A)
1680 RETURN
1690 REM
1700 REM*********************************************************
1710 REM               DISPLAY CORRECT ANSWER
1720 REM*********************************************************
1730 REM
1740 TR=0
1750 POKE LO,8
1760 IF V<10 POKE VA,V:X=USR4(A):GOTO1810
1770 IF V<100 VH=INT(V/10):POKE VA,VH:X=USR4(A):VT=V-10*VH:POKE
LO,9:POKE VA,VT:X=USR4(A):GOTO1810
1780 VH=INT(V/100):POKE VA,VH:X=USR4(A):POKE LO,9
1790 V1=V-100*VH:VT=INT(V1/10):POKE VA,VT:X=USR4(A)
1800 POKE LO,10:VO=V1-10*VT:POKE VA,VO:X=USR4(A)
1810 TR=0:FOR I= 1 TO 1000: NEXT I: GOTO 1460
1820 REM
1830 REM*********************************************************
1840 REM               SCAN FOR KEYBOARD RESPONSE
1850 REM*********************************************************
1860 REM
1870 POKE VA,15:IF L>0 GOTO 1880 ELSE POKE LO,0:X=USR4(A)
1880 IF F=0 THEN POKE LO,1
1890 X=USR4(A)
1900 A$="":FOR I=1TO 50
```

Listing 1 continues

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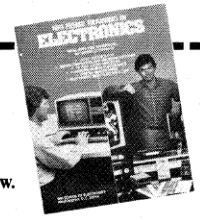

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Listing 1 continued

```
1910 A$=INKEY$
1920 IF A$<>"" GOTO 2020
1930 NEXT I
1940 POKE VA,16:IF L>0 GOTO 1950 ELSE POKE LO,0:X=USR4(A)
1950 IF F=0 POKE LO,1
1960 X=USR4(A)
1970 FOR I= 1 TO 50
1980 A$=INKEY$
1990 IF A$<>"" GOTO 2020
2000 NEXT I
2010 GOTO 1870
2020 RETURN
```

Program Listing 2. Assembly Program

```
F200          00010          ORG     0F200H
0001          00020 WINLOS   DEFS    1
0001          00030 PNTLOC   DEFS    1
0001          00040 NUMBER   DEFS    1
F203 FF00     00050 DELSTR   DEFW    00FFH
F205 FF00     00060 DELAY    DEFW    00FFH
              00070 ;
              00080 ;*****************************************************
              00090 ;                INITIALIZE BUFFER
              00100 ;*****************************************************
              00110 ;
F207 F5       00120 USR0     PUSH    AF                ;SAVE REGISTERS
F208 C5       00130          PUSH    BC
F209 E5       00140          PUSH    HL
F20A 21D3F5   00150          LD      HL,CLRCRT         ;GET BUFFER OF BLANKS
F20D 010004   00160          LD      BC,400H           ;LENGTH OF CRT MEMORY
F210 3E00     00170          LD      A,0               ;CLR 'A' REG.
F212 3620     00180 CLRLP    LD      (HL),20H          ;FILL WITH BLANKS
F214 23       00190          INC     HL                ;GO TO NEXT BLK LOCATION
F215 0B       00200          DEC     BC                ;DECREMENT COUNTER
F216 B8       00210          CP      B                 ;TEST IF B REG CLEAR
F217 20F9     00220          JR      NZ,CLRLP          ;DO AGAIN IF NOT
F219 B9       00230          CP      C                 ;TEST IF C REG CLEAR
F21A 20F6     00240          JR      NZ,CLRLP          ;DO AGAIN IF NOT
F21C E1       00250          POP     HL                ;RESTORE REGISTERS
F21D C1       00260          POP     BC
F21E F1       00270          POP     AF
F21F C9       00280          RET
              00290 ;
              00300 ;*****************************************************
              00310 ;        DISPLAY "LEVEL=" AND "+-x/ =" MESSAGES
              00320 ;*****************************************************
              00330 ;
F220 C5       00340 USR1     PUSH    BC                ;SAVE REGISTERS
F221 D5       00350          PUSH    DE
F222 E5       00360          PUSH    HL
F223 11403C   00370          LD      DE,3C40H          ;GET CRT PRINT LOCATION
F226 018000   00380          LD      BC,LVLLEN         ;GET LENGTH OF PRNT MSG
F229 2163F4   00390          LD      HL,LVLSTR         ;GET START OF PRNT MSG
F22C EDB0     00400          LDIR                      ;PUT IT ON THE CRT
F22E 11003D   00410          LD      DE,3D00H          ;GET START OF CRT LOC
F231 017000   00420          LD      BC,OPRLEN         ;GET LENGTH OF OPER MSG
F234 21E3F4   00430          LD      HL,OPRSTR         ;GET START OF OPER MSG
F237 EDB0     00440          LDIR
F239 E1       00450          POP     HL                ;RESTORE REGISTERS
F23A D1       00460          POP     DE
F23B C1       00470          POP     BC
F23C C9       00480          RET
              00490 ;
              00500 ;*****************************************************
              00510 ;                FLASH SCREEN AND PLAY MUSIC
              00520 ;*****************************************************
              00530 ;
F23D F5       00540 USR2     PUSH    AF                ;SAVE REGISTERS
F23E C5       00550          PUSH    BC
F23F D5       00560          PUSH    DE
F240 E5       00570          PUSH    HL
F241 DDE5     00580          PUSH    IX
F243 3A00F2   00590          LD      A,(WINLOS)        ;GET TYPE OF SOUND FLAG
F246 FE00     00600          CP      0                 ;TEST IF ZERO
F248 2837     00610          JR      Z,SNDRTN          ;JUMP IF 0
F24A 21003C   00620          LD      HL,3C00H          ;START OF CRT
F24D 11D3F9   00630          LD      DE,SAVCRT         ;CRT STORAGE BUFFER
F250 010004   00640          LD      BC,400H           ;LENGTH OF CRT
F253 EDB0     00650          LDIR                      ;SAVE CRT IMAGE
F255 21D3F5   00660 CLRSCN   LD      HL,CLRCRT         ;GET START OF BLANK BUFF
F258 11003C   00670          LD      DE,3C00H          ;START OF CRT
F25B 010004   00680          LD      BC,400H           ;LENGTH OF CRT
F25E EDB0     00690          LDIR                      ;CLEAR CRT
F260 CDC4F2   00700          CALL    DELTIM            ;WAIT
F263 21D3F9   00710          LD      HL,SAVCRT         ;GET OLD CRT IMAGE
F266 11003C   00720          LD      DE,3C00H          ;START OF CRT
F269 010004   00730          LD      BC,400H           ;LENGTH OF CRT
F26C EDB0     00740          LDIR                      ;RESTORE CRT IMAGE
F26E CDD9F2   00750          CALL    TIMTST            ;TEST IF FINISHED
F271 B9       00760          CP      C
F272 2805     00770          JR      Z,QUIT            ;QUIT IF DONE
F274 CDD3F2   00780          CALL    DELYLP            ;WAIT
F277 18DC     00790          JR      CLRSCN            ;CLEAR SCREEN AGAIN
F279 ED4B03F2 00800 QUIT     LD      BC,(DELSTR)       ;GET INITIAL DELAY
F27D ED4305F2 00810          LD      (DELAY),BC        ;RESTORE DELAY COUNTER
F281 3A00F2   00820 SNDRTN   LD      A,(WINLOS)        ;GET TYPE OF SOUND FLAG
F284 FE00     00830          CP      0                 ;TEST IF WRONG ANS FLAG
F286 2809     00840          JR      Z,WRONG
F288 3E64     00850          LD      A,SNDLNW          ;GET LENGTH OF BUFFER
F28A 57       00860          LD      D,A               ;PUT A REG. IN D REG.
F28B DD21D3FD 00870          LD      IX,SNDBFW         ;GET START OF BUFFER
F28F 1807     00880          JR      NXTNOT            ;PLAY MUSIC
F291 3E0A     00890 WRONG    LD      A,SNDLNL          ;GET LENGTH OF BUFFER
F293 57       00900          LD      D,A               ;PUT A REG. IN D REG.
F294 DD2137FE 00910          LD      IX,SNDBFL         ;GET START OF BUFFER
F298 DD6E00   00920 NXTNOT   LD      L,(IX)            ;GET DURATION OF NOTE
F29B DD23     00930          INC     IX                ;GO TO NEXT BUF LOCATION
F29D 15       00940          DEC     D                 ;DECREMENT LENGTH COUNT
F29E DD6600   00950          LD      H,(IX)            ;GET NOTE
F2A1 CDB0F2   00960          CALL    SNDGEN            ;PLAY NOTE
F2A4 DD23     00970          INC     IX                ;GO TO NEXT BUF LOCATION
F2A6 15       00980          DEC     D                 ;DECREMENT LENGTH COUNT
F2A7 20EF     00990          JR      NZ,NXTNOT         ;PLAY NEXT NOTE
F2A9 DDE1     01000          POP     IX                ;RESTORE REGISTERS
F2AB E1       01010          POP     HL
F2AC D1       01020          POP     DE
F2AD C1       01030          POP     BC
F2AE F1       01040          POP     AF
F2AF C9       01050          RET
F2B0 E5       01060 SNDGEN   PUSH    HL                ;TRANSFER HL TO BC
F2B1 C1       01070          POP     BC
F2B2 3E01     01080 LDNOTE   LD      A,1               ;SET UP FOR PORT OUTPUT
F2B4 69       01090          LD      L,C               ;GET NOTE IN L REG.
F2B5 D3FF     01100          OUT     (0FFH),A          ;OUTPUT A HI TO PORT
F2B7 2D       01110 OUTHI    DEC     L                 ;DEC NOTE COUNTER
F2B8 20FD     01120          JR      NZ,OUTHI          ;WAIT TILL REG. L=0
F2BA 3C       01130          INC     A                 ;SET UP NEXT PORT OUTPUT
F2BB 69       01140          LD      L,C               ;GET NOTE IN L AGAIN
F2BC D3FF     01150          OUT     (0FFH),A          ;OUTPUT A LO TO PORT
F2BE 2D       01160 OUTLO    DEC     L                 ;DEC NOTE COUNTER
F2BF 20FD     01170          JR      NZ,OUTLO          ;WAIT TILL REG. L=0
F2C1 10EF     01180          DJNZ    LDNOTE            ;DO TILL DURATION DONE
F2C3 C9       01190          RET
F2C4 ED4B05F2 01200 DELTIM   LD      BC,(DELAY)        ;GET CURRENT DELAY CNT
F2C8 3E00     01210          LD      A,0               ;CLEAR A REG.
F2CA CB39     01220          SRL     C                 ;DIVIDE C REG. BY 2
F2CC ED4305F2 01230          LD      (DELAY),BC        ;RESET DELAY CNT
F2D0 B9       01240          CP      C                 ;TEST IF DELAY DONE
F2D1 2806     01250          JR      Z,TIMTST          ;RETURN IF ZERO
F2D3 10FE     01260 DELYLP   DJNZ    $                 ;LOOP HERE 256 TIMES
F2D5 0D       01270          DEC     C                 ;DECREMENT C
F2D6 B9       01280          CP      C                 ;TEST IF C=0
```

Listing 2 continues

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Listing 2 continued

```
F2D7 20FA      01290          JR      NZ,DELYLP        ;LOOP TILL DONE
F2D9 ED4B05F2  01300 TIMTST   LD      BC,(DELAY)       ;GET CURRENT DELAY TIME
F2DD C9        01310          RET
               01320 ;
               01330 ;*****************************************************
               01340 ;                DISPLAY "RIGHT" MESSAGE
               01350 ;*****************************************************
               01360 ;
F2DE C5        01370 USR3     PUSH    BC               ;SAVE REGISTERS
F2DF D5        01380          PUSH    DE
F2E0 E5        01390          PUSH    HL
F2E1 018000    01400          LD      BC,RITLEN        ;GET LENGTH OF RIGHT SND
F2E4 11C03E    01410          LD      DE,3EC0H         ;LOC ON CRT FOR PRINT
F2E7 2153F5    01420          LD      HL,RITSTR        ;GET START OF MSG.
F2EA EDB0      01430          LDIR                     ;PRINT IT.
F2EC E1        01440          POP     HL
F2ED D1        01450          POP     DE
F2EE C1        01460          POP     BC
F2EF C9        01470          RET
               01480 ;
               01490 ;*****************************************************
               01500 ;                DISPLAY NUMBER OR CHARACTER
               01510 ;*****************************************************
               01520 ;
F2F0 F5        01530 USR4     PUSH    AF               ;SAVE REGISTERS
F2F1 C5        01540          PUSH    BC
F2F2 D5        01550          PUSH    DE
F2F3 E5        01560          PUSH    HL
F2F4 DDE5      01570          PUSH    IX
F2F6 2139F3    01580 DATLOC   LD      HL,NUMTBL        ;GET ADR OF CHARACTER TBL
F2F9 0600      01590          LD      B,0              ;CLR B REG
F2FB 3A02F2    01600          LD      A,(NUMBER)       ;GET INDEX INTO TABLE
F2FE 4F        01610          LD      C,A              ;TRANS. A TO C
F2FF CB21      01620          SLA     C                ;MULT BY 2 FOR 16 BIT OFFSET

F301 09        01630          ADD     HL,BC            ;OFFSET INTO TABLE
F302 4E        01640          LD      C,(HL)           ;PLACE 16 BIT ADR POINTED
F303 23        01650          INC     HL               ;TO BY HL INTO BC
F304 46        01660          LD      B,(HL)
F305 C5        01670          PUSH    BC               ;TRANSFER BC TO IX
F306 DDE1      01680          POP     IX
F308 215BF3    01690 CRTLOC   LD      HL,LOCTBL        ;GET ADR OF CRT TABLE
F30B 1600      01700          LD      D,0              ;CLR D REG.
F30D 3A01F2    01710          LD      A,(PNTLOC)       ;GET INDEX OF PRINT LOCATION

F310 5F        01720          LD      E,A              ;TRANSFER A TO E
F311 CB23      01730          SLA     E                ;MULT BY 2 FOR 16 BIT OFFSET

F313 19        01740          ADD     HL,DE            ;OFFSET INTO TABLE
F314 4E        01750          LD      C,(HL)           ;PLACE 16 BIT ADR POINTED
F315 23        01760          INC     HL               ;TO BY HL INTO BC
F316 46        01770          LD      B,(HL)
F317 C5        01780          PUSH    BC               ;TRANS BC TO HL
F318 E1        01790          POP     HL
F319 113900    01800 PUTUP    LD      DE,57            ;OFFSET FOR NEXT CRT LINE
F31C 0E02      01810          LD      C,2              ;NUMBER OF LINES TO DISPLAY
F31E 0607      01820 USRLP2   LD      B,7              ;# OF CHARS. ON EACH LINE
F320 DD7E00    01830 USRLP1   LD      A,(IX)           ;GET CHARACTER DATA
F323 77        01840          LD      (HL),A           ;PUT ON CRT
F324 23        01850          INC     HL               ;NEXT BYTE OF CHARACTER DATA

F325 DD23      01860          INC     IX               ;NEXT CRT ADDRESS
F327 10F7      01870          DJNZ    USRLP1           ;FINISH TOP HALF OF CHAR.
F329 0D        01880          DEC     C                ;GO TO NEXT CRT LINE
F32A 3E00      01890          LD      A,0
F32C B9        01900          CP      C                ;TEST IF CHARACTER DONE
F32D 19        01910          ADD     HL,DE            ;GO TO NEXT CRT LINE ADR.
F32E 2802      01920          JR      Z,RETPU          ;RETURN IF DONE
F330 18EC      01930          JR      USRLP2           ;DO NEXT LINE
F332 DDE1      01940 RETPU    POP     IX               ;RESTORE REGISTERS
F334 E1        01950          POP     HL
F335 D1        01960          POP     DE
F336 C1        01970          POP     BC
F337 F1        01980          POP     AF
F338 C9        01990          RET                      ;RETURN TO BASIC
               02000 ;
               02010 ;*****************************************************
               02020 ;                ADDRESS TABLES
               02030 ;*****************************************************
               02040 ;
F339 75F3      02050 NUMTBL   DEFW    ZERO             ;THIS TABLE CONTAINS THE
F33B 83F3      02060          DEFW    ONE              ;ADDRESSES OF THE DATA
F33D 91F3      02070          DEFW    TWO              ;BASE LOCATIONS FOR THE
F33F 9FF3      02080          DEFW    THREE            ;BLOCK NUMBER & CHARACTERS
F341 ADF3      02090          DEFW    FOUR
F343 BBF3      02100          DEFW    FIVE
F345 C9F3      02110          DEFW    SIX
F347 D7F3      02120          DEFW    SEVEN
F349 E5F3      02130          DEFW    EIGHT
F34B F3F3      02140          DEFW    NINE
F34D 01F4      02150          DEFW    PLUS
F34F 0FF4      02160          DEFW    MINUS
F351 1DF4      02170          DEFW    MULT
F353 2BF4      02180          DEFW    DIVIDE
F355 39F4      02190          DEFW    EQUAL
F357 47F4      02200          DEFW    QUES
F359 55F4      02210          DEFW    BLANK
F35B 713C      02220 LOCTBL   DEFW    3C71H            ;THIS TABLE CONTAINS THE
F35D 313D      02230 LOC1     DEFW    3D31H            ;ADDRESSES OF THE DIFFERENT
F35F C03D      02240 LOC2     DEFW    3DC0H            ;CRT LOCATIONS THE BLOCK
F361 C73D      02250 LOC3     DEFW    3DC7H            ;CHARACTERS ARE DISPLAYED
F363 CE3D      02260 LOC4     DEFW    3DCEH
F365 D53D      02270 LOC5     DEFW    3DD5H
F367 DC3D      02280 LOC6     DEFW    3DDCH
F369 E33D      02290 LOC7     DEFW    3DE3H
F36B EA3D      02300 LOC8     DEFW    3DEAH
F36D F13D      02310 LOC9     DEFW    3DF1H
F36F F83D      02320 LOC10    DEFW    3DF8H
F371 C03E      02330 LOC11    DEFW    3EC0H
F373 C73E      02340 LOC12    DEFW    3EC7H
               02350 ;
               02360 ;*****************************************************
               02370 ;        DATA BASE FOR NUMBERS AND CHARACTERS
               02380 ;*****************************************************
               02390 ;
F375 2020      02400 ZERO     DEFW    2020H            ;DATA FOR GENERATION OF 0
F377 BF        02410          DEFB    191
F378 83        02420          DEFB    131
F379 B3        02430          DEFB    179
F37A BF        02440          DEFB    191
F37B 8C        02450          DEFB    140
F37C 20        02460          DEFB    20H
F37D 8C        02470          DEFB    140
F37E BF        02480          DEFB    191
F37F B3        02490          DEFB    179
F380 B0        02500          DEFB    176
F381 BF        02510          DEFB    191
F382 20        02520          DEFB    20H
F383 2020      02530 ONE      DEFW    2020H            ;DATA FOR GENERATION OF 1
F385 2020      02540          DEFW    2020H
F387 BF        02550          DEFB    191
F388 2020      02560          DEFW    2020H
F38A 2020      02570          DEFW    2020H
F38C 2020      02580          DEFW    2020H
F38E BF        02590          DEFB    191
F38F 2020      02600          DEFW    2020H
F391 2020      02610 TWO      DEFW    2020H            ;DATA FOR GENERATION OF 2
F393 B3        02620          DEFB    179
F394 B3        02630          DEFB    179
F395 B3        02640          DEFB    179
F396 BF        02650          DEFB    191
F397 20        02660          DEFB    20H
F398 2020      02670          DEFW    2020H
F39A BF        02680          DEFB    191
F39B B0        02690          DEFB    176
F39C B0        02700          DEFB    176
F39D B0        02710          DEFB    176
F39E 20        02720          DEFB    20H
F39F 2020      02730 THREE    DEFW    2020H            ;DATA FOR GENERATION OF 3
F3A1 83        02740          DEFB    131
F3A2 B3        02750          DEFB    179
F3A3 B3        02760          DEFB    179
```

Listing 2 continues

Listing 2 continued

```
F3A4 BF      02770          DEFB   191
F3A5 20      02780          DEFB   20H
F3A6 2020    02790          DEFW   2020H
F3A8 B0      02800          DEFB   176
F3A9 B0      02810          DEFB   176
F3AA B0      02820          DEFB   176
F3AB BF      02830          DEFB   191
F3AC 20      02840          DEFB   20H
F3AD 2020    02850 FOUR     DEFW   2020H          ;DATA FOR GENERATION OF 4
F3AF BF      02860          DEFB   191
F3B0 B0      02870          DEFB   176
F3B1 B0      02880          DEFB   176
F3B2 BF      02890          DEFB   191
F3B3 20      02900          DEFB   20H
F3B4 2020    02910          DEFW   2020H
F3B6 2020    02920          DEFW   2020H
F3B8 20      02930          DEFB   20H
F3B9 BF      02940          DEFB   191
F3BA 20      02950          DEFB   20H
F3BB 2020    02960 FIVE     DEFW   2020H          ;DATA FOR GENERATION OF 5
F3BD BF      02970          DEFB   191
F3BE B3      02980          DEFB   179
F3BF B3      02990          DEFB   179
F3C0 B3      03000          DEFB   179
F3C1 20      03010          DEFB   20H
F3C2 2020    03020          DEFW   2020H
F3C4 B0      03030          DEFB   176
F3C5 B0      03040          DEFB   176
F3C6 B0      03050          DEFB   176
F3C7 BF      03060          DEFB   191
F3C8 20      03070          DEFB   20H
F3C9 2020    03080 SIX      DEFW   2020H          ;DATA FOR GENERATION OF 6
F3CB BF      03090          DEFB   191
F3CC B3      03100          DEFB   179
F3CD B3      03110          DEFB   179
F3CE B3      03120          DEFB   179
F3CF 20      03130          DEFB   20H
F3D0 2020    03140          DEFW   2020H
F3D2 BF      03150          DEFB   191
F3D3 B0      03160          DEFB   176
F3D4 B0      03170          DEFB   176
F3D5 BF      03180          DEFB   191
F3D6 20      03190          DEFB   20H
F3D7 2020    03200 SEVEN    DEFW   2020H          ;DATA FOR GENERATION OF 7
F3D9 83      03210          DEFB   131
F3DA 83      03220          DEFB   131
F3DB 83      03230          DEFB   131
F3DC BF      03240          DEFB   191
F3DD 20      03250          DEFB   20H
F3DE 2020    03260          DEFW   2020H
F3E0 2020    03270          DEFW   2020H
F3E2 20      03280          DEFB   20H
F3E3 BF      03290          DEFB   191
F3E4 20      03300          DEFB   20H
F3E5 2020    03310 EIGHT    DEFW   2020H          ;DATA FOR GENERATION OF 8
F3E7 BF      03320          DEFB   191
F3E8 B3      03330          DEFB   179
F3E9 B3      03340          DEFB   179
F3EA BF      03350          DEFB   191
F3EB 20      03360          DEFB   20H
F3EC 2020    03370          DEFW   2020H
F3EE BF      03380          DEFB   191
F3EF B0      03390          DEFB   176
F3F0 B0      03400          DEFB   176
F3F1 BF      03410          DEFB   191
F3F2 20      03420          DEFB   20H
F3F3 2020    03430 NINE     DEFW   2020H          ;DATA FOR GENERATION OF 9
F3F5 BF      03440          DEFB   191
F3F6 B3      03450          DEFB   179
F3F7 B3      03460          DEFB   179
F3F8 BF      03470          DEFB   191
F3F9 20      03480          DEFB   20H
F3FA 2020    03490          DEFW   2020H
F3FC B0      03500          DEFB   176
F3FD B0      03510          DEFB   176
F3FE B0      03520          DEFB   176
F3FF BF      03530          DEFB   191
F400 20      03540          DEFB   20H
F401 2020    03550 PLUS     DEFW   2020H          ;DATA FOR GENERATION OF +
F403 20      03560          DEFB   20H
F404 BC      03570          DEFB   188
F405 2020    03580          DEFW   2020H
F407 2020    03590          DEFW   2020H
F409 83      03600          DEFB   131
F40A 83      03610          DEFB   131
F40B BF      03620          DEFB   191
F40C 83      03630          DEFB   131
F40D 83      03640          DEFB   131
F40E 20      03650          DEFB   20H
F40F 2020    03660 MINUS    DEFW   2020H          ;DATA FOR GENERATION OF -
F411 2020    03670          DEFW   2020H
F413 2020    03680          DEFW   2020H
F415 2020    03690          DEFW   2020H
F417 83      03700          DEFB   131
F418 83      03710          DEFB   131
F419 83      03720          DEFB   131
F41A 83      03730          DEFB   131
F41B 83      03740          DEFB   131
F41C 20      03750          DEFB   20H
F41D 20      03760 MULT     DEFB   20H            ;DATA FOR GENERATION OF x
F41E 8C      03770          DEFB   140
F41F B0      03780          DEFB   176
F420 20      03790          DEFB   20H
F421 B0      03800          DEFB   176
F422 8C      03810          DEFB   140
F423 20      03820          DEFB   20H
F424 20      03830          DEFB   20H
F425 B0      03840          DEFB   176
F426 8C      03850          DEFB   140
F427 83      03860          DEFB   131
F428 8C      03870          DEFB   140
F429 B0      03880          DEFB   176
F42A 20      03890          DEFB   20H
F42B 2020    03900 DIVIDE   DEFW   2020H          ;DATA FOR GENERATION OF /
F42D 20      03910          DEFB   20H
F42E 8C      03920          DEFB   140
F42F 2020    03930          DEFW   2020H
F431 2020    03940          DEFW   2020H
F433 83      03950          DEFB   131
F434 83      03960          DEFB   131
F435 B3      03970          DEFB   179
F436 83      03980          DEFB   131
F437 83      03990          DEFB   131
F438 20      04000          DEFB   20H
F439 20      04010 EQUAL    DEFB   20H            ;DATA FOR GENERATION OF =
F43A B0      04020          DEFB   176
F43B B0      04030          DEFB   176
F43C B0      04040          DEFB   176
F43D B0      04050          DEFB   176
F43E B0      04060          DEFB   176
F43F 20      04070          DEFB   20H
F440 20      04080          DEFB   20H
F441 8C      04090          DEFB   140
F442 8C      04100          DEFB   140
F443 8C      04110          DEFB   140
F444 8C      04120          DEFB   140
F445 8C      04130          DEFB   140
F446 20      04140          DEFB   20H
F447 2020    04150 QUES     DEFW   2020H          ;DATA FOR GENERATION OF ?
F449 83      04160          DEFB   131
F44A B3      04170          DEFB   179
F44B B3      04180          DEFB   179
F44C BF      04190          DEFB   191
F44D 20      04200          DEFB   20H
F44E 2020    04210          DEFW   2020H
F450 20      04220          DEFB   20H
F451 B3      04230          DEFB   179
F452 2020    04240          DEFW   2020H
F454 20      04250          DEFB   20H
F455 20      04260 BLANK    DEFM   '              ';DATA FOR GENERATION OF
F463 20      04270 LVLSTR   DEFM   '        '      ;DATA FOR "LEVEL="
F46C BF      04280          DEFB   191
```

Listing 2 continues

Listing 2 continued

```
F46D 20        04290          DEFM    '      '
F473 BF        04300          DEFB    191
F474 B3        04310          DEFB    179
F475 B3        04320          DEFB    179
F476 B3        04330          DEFB    179
F477 20        04340          DEFM    '   '
F47A AF        04350          DEFB    175
F47B 90        04360          DEFB    144
F47C A0        04370          DEFB    160
F47D 9F        04380          DEFB    159
F47E 20        04390          DEFM    '   '
F481 BF        04400          DEFB    191
F482 B3        04410          DEFB    179
F483 B3        04420          DEFB    179
F484 B3        04430          DEFB    179
F485 20        04440          DEFM    '   '
F488 BF        04450          DEFB    191
F489 20        04460          DEFM    '      '
F48F B0        04470          DEFB    176
F490 B0        04480          DEFB    176
F491 B0        04490          DEFB    176
F492 B0        04500          DEFB    176
F493 20        04510          DEFM    '                    '
F4AC BF        04520          DEFB    191
F4AD B0        04530          DEFB    176
F4AE B0        04540          DEFB    176
F4AF B0        04550          DEFB    176
F4B0 20        04560          DEFM    '   '
F4B3 BF        04570          DEFB    191
F4B4 B0        04580          DEFB    176
F4B5 B0        04590          DEFB    176
F4B6 B0        04600          DEFB    176
F4B7 20        04610          DEFM    '   '
F4BA 82        04620          DEFB    130
F4BB A9        04630          DEFB    169
F4BC 96        04640          DEFB    150
F4BD 81        04650          DEFB    129
F4BE 20        04660          DEFM    '   '
F4C1 BF        04670          DEFB    191
F4C2 B0        04680          DEFB    176
F4C3 B0        04690          DEFB    176
F4C4 B0        04700          DEFB    176
F4C5 20        04710          DEFM    '   '
F4C8 BF        04720          DEFB    191
F4C9 B0        04730          DEFB    176
F4CA B0        04740          DEFB    176
F4CB B0        04750          DEFB    176
F4CC 20        04760          DEFM    '   '
F4CF 8C        04770          DEFB    140
F4D0 8C        04780          DEFB    140
F4D1 8C        04790          DEFB    140
F4D2 8C        04800          DEFB    140
F4D3 20        04810          DEFM    '    '
F4D7 B3        04820          DEFB    179
F4D8 20        04830          DEFM    '            '
0080           04840 LVLLEN   EQU     $-LVLSTR
F4E3 20        04850 OPRSTR   DEFM    '            '    ;DATA FOR "+-x/ ="
F4ED BC        04860          DEFB    188
F4EE 20        04870          DEFM    '            '
F4F9 8C        04880          DEFB    140
F4FA B0        04890          DEFB    176
F4FB 20        04900          DEFB    20H
F4FC B0        04910          DEFB    176
F4FD 8C        04920          DEFB    140
F4FE 2020      04930          DEFW    2020H
F500 2020      04940          DEFW    2020H
F502 20        04950          DEFB    20H
F503 B0        04960          DEFB    176
F504 8C        04970          DEFB    140
F505 20        04980          DEFM    '            '
F50E B0        04990          DEFB    176
F50F B0        05000          DEFB    176
F510 B0        05010          DEFB    176
F511 B0        05020          DEFB    176
F512 B0        05030          DEFB    176
F513 20        05040          DEFM    '                    '
```

```
F52B 83        05050          DEFB    131
F52C 83        05060          DEFB    131
F52D BF        05070          DEFB    191
F52E 83        05080          DEFB    131
F52F 83        05090          DEFB    131
F530 2020      05100          DEFW    2020H
F532 83        05110          DEFB    131
F533 83        05120          DEFB    131
F534 83        05130          DEFB    131
F535 83        05140          DEFB    131
F536 83        05150          DEFB    131
F537 2020      05160          DEFW    2020H
F539 B0        05170          DEFB    176
F53A 8C        05180          DEFB    140
F53B 83        05190          DEFB    131
F53C 8C        05200          DEFB    140
F53D B0        05210          DEFB    176
F53E 2020      05220          DEFW    2020H
F540 B0        05230          DEFB    176
F541 8C        05240          DEFB    140
F542 83        05250          DEFB    131
F543 20        05260          DEFM    '            '
F54E 8C        05270          DEFB    140
F54F 8C        05280          DEFB    140
F550 8C        05290          DEFB    140
F551 8C        05300          DEFB    140
F552 8C        05310          DEFB    140
0070           05320 OPRLEN   EQU     $-OPRSTR
F553 20        05330 RITSTR   DEFM    '                    '    ;DATA FOR "RIGHT"
F56A BF        05340          DEFB    191
F56B B3        05350          DEFB    179
F56C B3        05360          DEFB    179
F56D BF        05370          DEFB    191
F56E 2020      05380          DEFW    2020H
F570 20        05390          DEFB    20H
F571 83        05400          DEFB    131
F572 AB        05410          DEFB    171
F573 97        05420          DEFB    151
F574 83        05430          DEFB    131
F575 2020      05440          DEFW    2020H
F577 20        05450          DEFB    20H
F578 BF        05460          DEFB    191
F579 83        05470          DEFB    131
F57A B3        05480          DEFB    179
F57B B3        05490          DEFB    179
F57C 2020      05500          DEFW    2020H
F57E 20        05510          DEFB    20H
F57F BF        05520          DEFB    191
F580 B0        05530          DEFB    176
F581 B0        05540          DEFB    176
F582 BF        05550          DEFB    191
F583 2020      05560          DEFW    2020H
F585 20        05570          DEFB    20H
F586 83        05580          DEFB    131
F587 83        05590          DEFB    131
F588 BF        05600          DEFB    191
F589 83        05610          DEFB    131
F58A 83        05620          DEFB    131
F58B 20        05630          DEFM    '                    '
F5AA BF        05640          DEFB    191
F5AB 83        05650          DEFB    131
F5AC 8C        05660          DEFB    140
F5AD B0        05670          DEFB    176
F5AE 2020      05680          DEFW    2020H
F5B0 20        05690          DEFB    20H
F5B1 B0        05700          DEFB    176
F5B2 BA        05710          DEFB    186
F5B3 B5        05720          DEFB    181
F5B4 B0        05730          DEFB    176
F5B5 2020      05740          DEFW    2020H
F5B7 20        05750          DEFB    20H
F5B8 BF        05760          DEFB    191
F5B9 B0        05770          DEFB    176
F5BA B0        05780          DEFB    176
F5BB BF        05790          DEFB    191
F5BC 2020      05800          DEFW    2020H
```

Listing 2 continues

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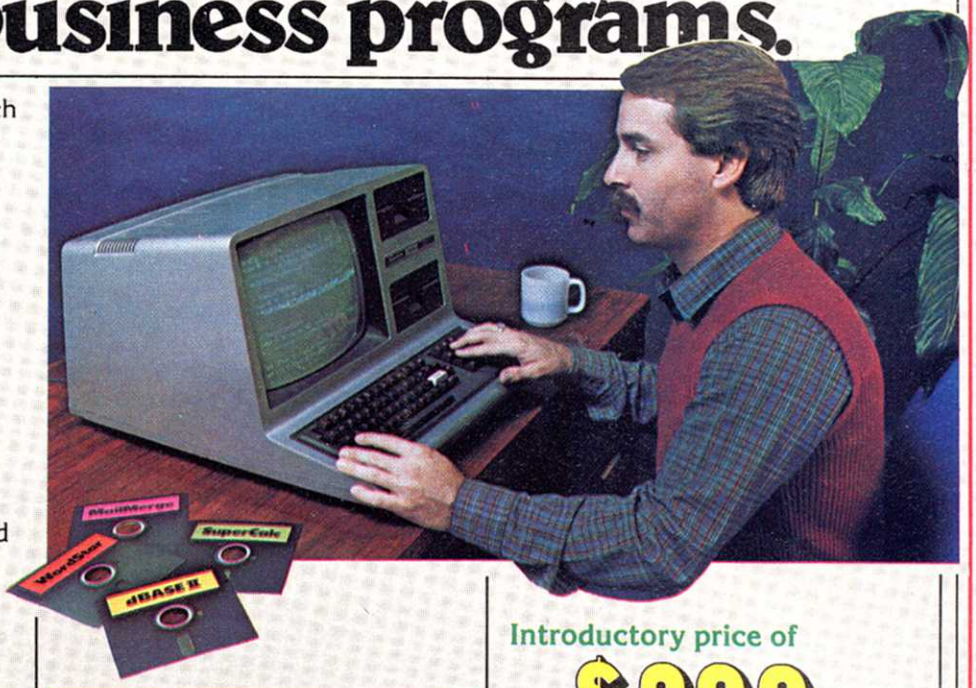

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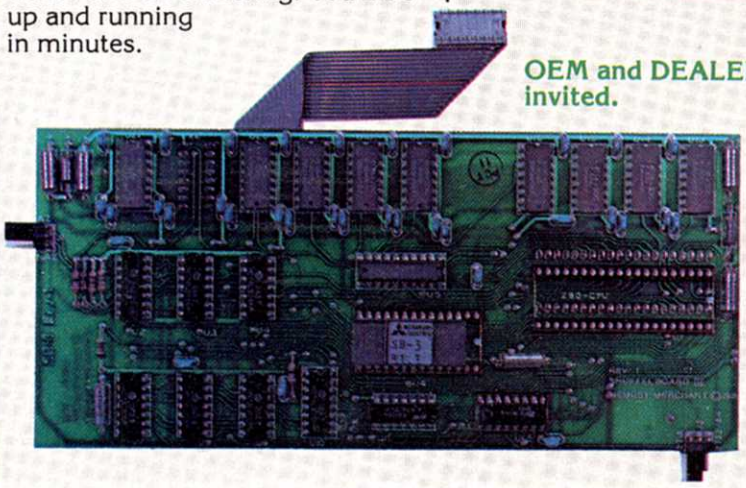

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Listing 2 continued

```
F5BE 20        05810          DEFB    20H
F5BF BF        05820          DEFB    191
F5C0 2020      05830          DEFW    2020H
F5C2 BF        05840          DEFB    191
F5C3 20        05850          DEFM    '     '
F5C8 BF        05860          DEFB    191
F5C9 20        05870          DEFM    '         '
0080           05880 RITLEN   EQU     $-RITSTR
0400           05890 CLRCRT   DEFS    400H            ;CRT BLANK BUFFER
F9D3           05900 CLREND   EQU     $
0400           05910 SAVCRT   DEFS    400H            ;SAVE CRT BUFFER
FDD3           05920 SAVEND   EQU     $
               05930 ;
               05940 ;*****************************************************
               05950 ;                DATA BASE FOR MUSIC
               05960 ;*****************************************************
               05970 ;
FDD3 A631      05980 SNDBFW   DEFW    31A6H           ;NOTE 'G' ABOVE 'MID C'
FDD5 01FF      05990          DEFW    0FF01H
FDD7 C629      06000          DEFW    29C6H           ;NOTE 'E' ABOVE 'MID C'
FDD9 01FF      06010          DEFW    0FF01H
FDDB FE41      06020          DEFW    41FEH           ;NOTE 'MID C'
FDDD 01FF      06030          DEFW    0FF01H
FDDF FE41      06040          DEFW    41FEH           ;NOTE 'MID C'
FDE1 01FF      06050          DEFW    0FF01H
FDE3 FE20      06060          DEFW    20FEH           ;NOTE 'MID C'
FDE5 01FF      06070          DEFW    0FF01H
FDE7 E024      06080          DEFW    24E0H           ;NOTE 'D' ABOVE 'MID C'
FDE9 01FF      06090          DEFW    0FF01H
FDEB C629      06100          DEFW    29C6H           ;NOTE 'E' ABOVE 'MID C'
FDED 01FF      06110          DEFW    0FF01H
FDEF B32B      06120          DEFW    2BB3H           ;NOTE 'F' ABOVE 'MID C'
FDF1 01FF      06130          DEFW    0FF01H
FDF3 A662      06140          DEFW    62A6H           ;NOTE 'G' ABOVE 'MID C'
FDF5 01FF      06150          DEFW    0FF01H
FDF7 A662      06160          DEFW    62A6H           ;NOTE 'G' ABOVE 'MID C'
FDF9 01FF      06170          DEFW    0FF01H
FDFB A662      06180          DEFW    62A6H           ;NOTE 'G' ABOVE 'MID C'
FDFD 01FF      06190          DEFW    0FF01H
FDFF C663      06200          DEFW    63C6H           ;NOTE 'E' ABOVE 'MID C'
FE01 01FF      06210          DEFW    0FF01H
FE03 01FF      06220          DEFW    0FF01H
FE05 01FF      06230          DEFW    0FF01H
FE07 01FF      06240          DEFW    0FF01H
FE09 01FF      06250          DEFW    0FF01H
FE0B 01FF      06260          DEFW    0FF01H
FE0D FE21      06270          DEFW    21FEH           ;NOTE 'MID C'
FE0F 01FF      06280          DEFW    0FF01H
FE11 C629      06290          DEFW    29C6H           ;NOTE 'E' ABOVE 'MID C'
FE13 01FF      06300          DEFW    0FF01H
FE15 A631      06310          DEFW    31A6H           ;NOTE 'G' ABOVE 'MID C'
FE17 01FF      06320          DEFW    0FF01H
FE19 7C21      06330          DEFW    217CH           ;NOTE 'C' ABOVE 'MID C'
FE1B 01FF      06340          DEFW    0FF01H
FE1D 01FF      06350          DEFW    0FF01H
FE1F 01FF      06360          DEFW    0FF01H
FE21 01FF      06370          DEFW    0FF01H
FE23 01FF      06380          DEFW    0FF01H
FE25 01FF      06390          DEFW    0FF01H
FE27 01FF      06400          DEFW    0FF01H
FE29 01FF      06410          DEFW    0FF01H
FE2B 01FF      06420          DEFW    0FF01H
FE2D A618      06430          DEFW    18A6H           ;NOTE 'G' ABOVE 'MID C'
FE2F 01FF      06440          DEFW    0FF01H
FE31 7CFF      06450          DEFW    0FF7CH          ;NOTE 'C' ABOVE 'MID C'
FE33 7CFF      06460          DEFW    0FF7CH          ;NOTE 'C' ABOVE 'MID C'
FE35 7CFF      06470          DEFW    0FF7CH          ;NOTE 'C' ABOVE 'MID C'
0064           06480 SNDLNW   EQU     $-SNDBFW
FE37 BC80      06490 SNDBFL   DEFW    80BCH           ;NOTE 'F' ABOVE 'MID C'
FE39 BC80      06500          DEFW    80BCH           ;NOTE 'F' ABOVE 'MID C'
FE3B 01FF      06510          DEFW    0FF01H
FE3D E080      06520          DEFW    80E0H           ;NOTE 'D' ABOVE 'MID C'
FE3F E080      06530          DEFW    80E0H           ;NOTE 'D' ABOVE 'MID C'
000A           06540 SNDLNL   EQU     $-SNDBFL
0000           06550          END

00000 TOTAL ERRORS
```

```
10 REM VARIABLE LO DEFINES ASSEMBLY LOCATION 'PNTLOC'
20 REM VARIABLE VA DEFINES ASSEMBLY LOCATION 'NUMBER'
30 REM VARIABLE WI DEFINES ASSEMBLY LOCATION 'WINLOS'
35 REM VARIABLE RO DEFINES ASSEMBLY LOCATION 'ROUTIN'
40 REM POKE RO,0:X=USR(A)       INITIALIZES BUFFER IN ASSEMBLY RO
UTINE
50 REM POKE RO,1:X=USR(A)       PRINTS "LEVEL=" AND "+-x/ ="
60 REM POKE RO,2:X=USR(A)       CORRECT ANSWER ROUTINE
70 REM POKE RO,3:X=USR(A)       PRINTS "RIGHT"
80 REM POKE RO,4:X=USR(A)       PRINTS A NUMBER OR CHARACTER OF T
HE CRT
90 REM
100 REM*******************************************************
110 REM            INITIALIZATION AND SETUP
120 REM*******************************************************
130 REM
140 CLS:DEFINT A,F,H,I,L,N,O,P,Q,R,T,V,W,X,Y,Z
150 PRINT:INPUT"ENTER DECIMAL ADDRESS OF ASSEMBLY LOCATION 'TAPM
OD'";Z#
160 A=Z#/256:POKE 16527,A
170 A=Z#-A*256:POKE 16526,A
180 RO=-3581:  REM THIS IS HEX F203
190 LO=-3583:  REM THIS IS HEX F201
200 VA=-3582:  REM THIS IS HEX F202
210 WI=-3584:  REM THIS IS HEX F200
```

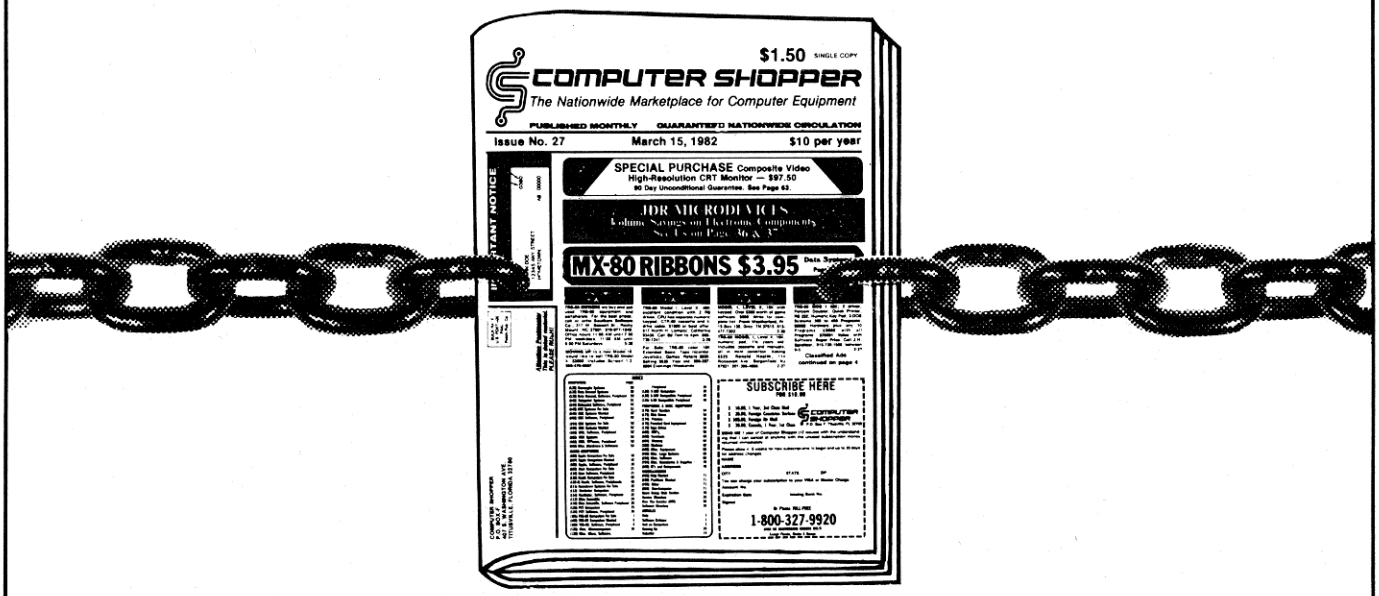
Program Listing 3. Changes to Basic Program for a Tape System

```
F200           00001          ORG     0F200H
0001           00002 WINLOS   DEFS    1
0001           00003 PNTLOC   DEFS    1
0001           00004 NUMBER   DEFS    1
0001           00005 ROUTIN   DEFS    1
F204 FF00      00006 DELSTR   DEFW    00FFH
F206 FF00      00007 DELAY    DEFW    00FFH
               00010 ;*****************************************************
               00012 ;                DETERMINE CORRECT USR CALL
               00014 ;*****************************************************
F208 F5        00016 TAPMOD   PUSH    AF              ;SAVE AF REG
F209 3A03F2    00018          LD      A,(ROUTIN)      ;GET ROUTINE TO EXEC.
F20C FE00      00020          CP      0               ;IS IT USR0
F20E 2005      00022          JR      NZ,TEST1        ;NO
F210 CD39F2    00024          CALL    USR0            ;EXECUTE USR0
F213 F1        00026          POP     AF              ;RESTORE AF REG.
F214 C9        00028          RET
F215 FE01      00030 TEST1    CP      1               ;IS IT USR1
F217 2005      00032          JR      NZ,TEST2        ;NO
F219 CD52F2    00034          CALL    USR1            ;EXECUTE USR1
F21C F1        00036          POP     AF              ;RESTORE AF REG
F21D C9        00038          RET
F21E FE02      00040 TEST2    CP      2               ;IS IT USR2
F220 2005      00042          JR      NZ,TEST3        ;NO
F222 CD6FF2    00044          CALL    USR2            ;EXECUTE USR2
F225 F1        00046          POP     AF              ;RESTORE AF REG.
F226 C9        00048          RET
F227 FE03      00050 TEST3    CP      3               ;IS IT USR3
F229 2005      00052          JR      NZ,TEST4        ;NO
F22B CD10F3    00054          CALL    USR3            ;EXECUTE USR3
F22E F1        00056          POP     AF              ;RESTORE AF REG.
F22F C9        00058          RET
F230 FE04      00060 TEST4    CP      4               ;IS IT USR5
F232 2003      00062          JR      NZ,ENDTST       ;NO
F234 CD22F3    00064          CALL    USR4            ;EXECUTE USR4
F237 F1        00066 ENDTST   POP     AF              ;RESTORE AF REG.
F238 C9        00068          RET
```

Program Listing 4. Changes to Assembly Program for a Tape System

YOU'VE JUST FOUND

THE MISSING LINK!



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The Intersoft C Compiler

by Rowland Archer

Although the C language is an interesting and useful programming tool, this package requires additional software and knowledge of Assembly.

★ ½

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$15 manual only (can be applied towards purchase)

The Intersoft C compiler is available for the Model I and III as well as Digital Research Corporation's CP/M and Technical Systems Consultants' Flex system for the 6809. I did most of my testing on a Model I, although I did manage to get some limited test time in under LDOS on a Model III.

The C language was developed at Bell Labs by Dennis Ritchie. Although C was developed on the UNIX operating system, and in turn most of UNIX was rewritten in C, it is not necessary to have UNIX in order to develop and run C programs.

C is usually classified as a medium-level language, meaning that it is a higher level than Assembly language, but lower than languages such as PL/I and Pascal. Functions written in C can perform many operations that are built into other languages, such as conversion between data types and reading and writing to files. This keeps the core of C simple and uncluttered, yet functions are available to do most of the things that you can do with higher-level languages.

The Program Listing shows a simple C program that accepts a line of text, reverses it, and prints it back out. To me, C feels more like Pascal assembly. The example program is explained in more detail in the sidebar.

Intersoft C is not a complete implementation of the C language. Although there is no standard for C, the de facto standard is described in Brian W. Kernighan and Dennis M. Ritchie's book *The C Programming Language* (Prentice-Hall, Englewood Cliffs, NJ, 1978). Intersoft C is derived from Ron Cain's Small C, which is a subset of the full C language.

Intersoft C is supplied on a TRS-80-formatted data disk with no operating system. You will need to copy these files onto a DOS disk. If you have only one disk drive, you will need a DOS with a single-drive file-copy function. There is an elaborate alternative procedure, described in the manual, that lets you copy the files to a DOS disk on a single-drive system using a text editor, a disk-based editor/assembler, and the DOS Load and Dump commands. If you use this approach, don't waste time looking for the table of program load addresses mentioned in the manual—the addresses you need are printed on the disk labels.

Using Intersoft C

The Intersoft C package, as delivered, is not sufficient by itself for developing and running C programs. In order to use the system, you must own or purchase a disk-based, line-numberless text editor and a Z80 assembler program. To create C programs, you need an editor and an assembler because the C compiler's output is Z80 Assembly code, which must be assembled before it can be run.

Before you can use the package, you must edit, compile, or assemble the support libraries: CSUPP/C and Z80LIB /MAC or Z80LIB/ASM, depending on your own version. The editing involves deleting some lines in the CSUPP/C file to make it work with your machine and assembler. I think this should be done by Intersoft since they are already supplying different versions of the system depending on the machine and assembler you own.

Before it can be compiled, a C program has to be typed into a file. I was surprised to find that the manual never describes the format of a C program source file, and it only hints at how you can create one. The first appendix casually mentions that you can use whatever text processing system you have available. It appears that you can use any text editor that creates plain ASCII files without line numbers. I used Radio Shack's Scripsit word processor. You cannot use the TRS-80's Basic text editor or EDTASM's editor because they generate line numbers, which the C compiler does not tolerate.

The recommended assemblers are either a disk conversion of Radio Shack's EDTASM, such as the one provided by Apparat with their NEW-

DOS80, or Microsoft's M80 macro assembler. Any disk-based assembler that is file-compatible with either of these should work, too.

Depending on which text editor, assembler, and operating system you use, life with the Intersoft C compiler can be either fairly smooth or downright tedious. Figure 1 shows the steps required to create, compile, and run a program under what I consider to be the best environment. Figure 2 shows the steps required under the least favorable environment.

In Fig. 1, your text editor allows direct entry of these special characters required by C:

- Braces, { }, used to delimit compound statements in C (like Begin... End in Pascal);
- Brackets, [ ], used with array variables to delimit the array index;
- Vertical bar, |, the logical "or" operator;
- Tilde, ~, the "one's complement" operator; and
- Caret, ^, the logical "exclusive or" operator.

Although the TRS-80 does not include these special characters on its keyboard, there are several text editors available, such as Apparat's Flextext (a patch to Scripsit), that allow you to enter them directly.

The next step in Figure 1 is to run the C compiler, which produces Z80 assembler source-code statements from your C program. The compiler gives you the option of having the C program source text appear in the output file along with the assembler statements. This lets you determine which assembler lines came from each C program statement.

When you run the compiler, you must decide whether to define globals—allocate memory for global variables. This topic is a bit confusing, and the need to answer this question every time you run the compiler is an unusual requirement. Standard C handles this issue with the EXTERN declaration, which Intersoft C does not support.

Next, using Microsoft's M80 assembler, assemble the file that was generated by the compiler to create a standard "/REL" (relocatable object code) file. Finally, run L80, the linking loader, to combine the /REL file just produced with one or more other /REL files that contain C run-time support programs and library functions. This last step creates an executable code file (a TRSDOS "/CMD" file) which can be run directly from the DOS READY prompt.

Except for the extra step of running the assembler, this involves no more work than running most compilers. Generating and storing the intermediate assembler source file takes a little more time and disk space. The whole process of compiling, assembling, and loading a C program is made easier if your DOS allows you to create a file of keyboard commands and then run that file. Most TRS-80 DOSes call this feature the "DO file" or "chaining."

Now we come to Fig. 2. You would have to want to write C programs pretty badly to use this setup. The whole purpose of writing in a language like C is to

continues on page 202

```
Demo C program to read a line of text from
the keyboard (STDIN) and write the reverse
of that line to the CRT (STDOUT)

#include stdio/h
#define strlength 64

revstr(str, rstr)
   char str[], rstr[];
{
   int i,j;
   i = strlen(str) - 1;
   j = 0;
   while (i >= 0)
      rstr[j++] = str[i--];
   rstr[j] = EOS;
}

main(argc, argv)
   int argc, argv[];
{
   char line[strlength], rline[strlength];

   puts("Type a line:      ");
   putchar(EOL);
   gets(line);
   revstr(line, rline);
   puts("The reverse of what you typed is:  ");
   putchar(EOL);
   puts(rline);
}
```

Program Listing. Sample C Program

1.	Use a text editor that allows typing of special characters (see text) to produce:	C Program Source
2.	Use the M80 version of the C compiler to produce:	Z80 Assembler Source, M80 format
3.	Use the M80 macro assembler to produce:	Relocatable Object Code (/REL file)
4.	Use the L80 loader to combine the above file with run-time libraries to produce:	Executable Object Code (/CMD file)

Fig. 1. Steps required to create, compile, and assemble a C program using a text editor that allows the entry of C's special characters, and the M80 macro assembler.

1.	Use a text editor that does not allow the entry of special characters to produce:	C Program Source
2.	Use the preprocessor to translate escape sequences to special characters:	Preprocessed C Program Source
3.	Use the EDTASM version of the C compiler to produce:	Z80 Assembler Source, EDTASM format, no line #'s
4.	Use the postprocessor to add line numbers to the above:	Z80 Assembler Source, EDTASM format, w/line #'s
5.	Use EDTASM to combine the above file with run-time libraries to produce:	Executable Object Code (/CMD file)

Fig. 2. Steps required to create, compile, and assemble a C program using a text editor that does not allow the entry of C's special characters and the EDTASM assembler.

A Closer Look at the Listing

The program Listing is a C program which accepts a line typed at the keyboard, reverses it and prints it out on the CRT. This program demonstrates only a tiny fraction of C's potential, but it may give you a feeling for the C language.

The first statement past the title comment is a compiler directive to "include" the file "stdio/h" at this point in the program. This causes the compiler to open stdio/h and compile its contents. Stdio/h contains "#define" statements for some implementation-dependent constants such as EOL and EOS, described below.

The "#define" statement is another compiler directive. As used here, it tells the compiler to replace the identifier "strlength" everywhere it occurs with the value 64. Using #define statements to establish symbolic constants makes it easier to change the value of a constant that is used in several places in a program.

A C program is a collection of functions, similar to the way a Pascal program is a collection of functions and procedures. Functions can be called from other functions and they can return values, just as SIN(X) returns the sine of X in Basic. They can also change the value of the variables passed as arguments, as you will see in a moment.

The first function defined in the listing is named "revstr". It reverses what is in "str" and stores the result in "rstr". The header line gives the name of the function and its formal arguments or parameters: rstr and str. The header is followed by a declaration that tells the data type of the function's arguments. The declaration "char str[ ], rstr[ ];" says that str and rstr are character arrays. Using two brackets [ ] with no number in between says that these arrays can be of whatever size the calling function uses.

C uses { } like Pascal uses Begin and End, to delimit a compound statement. Right after its opening {, revstr declares two local integer variables, i and j. Memory is allocated for local variables when a function is invoked at run time, and deallocated when the function is exited. C has only local and global variables; it is not a block-structured language. (Block structure means that you can nest one procedure inside another; each procedure can reference variables in itself and all the procedures that enclose it).

The character arrays "str" and "rstr" are used to hold variable length text strings. C builds variable length strings by storing consecutive characters in adjacent elements of an array. An ASCII null (0) character is stored as a terminator after the last character in the string. This terminator is symbolically referred to as EOS—the End-Of-String character. EOS is one of the constants defined in the "included" file, stdio/h.

"A C program is a collection of functions."

The first statement of the function revstr assigns the value "strlen(str) – 1" to the variable i. This initializes i to be the index of the last character (before EOS) in str. "Strlen" is a C library function which returns the length of its string argument. It counts all the characters up to, but not including, EOS.

The variable j is initialized to zero in the next statement. This makes j the index of the first character of rstr.

The "while" loop is where the bulk of the work is done. It says to execute the loop body as long as i is greater than or equal to zero. In this case, the loop body is only a single statement. A compound statement, delimited by { }'s, can also be used.

The loop body statement, "rstr[j + +] = str[i – –];", copies the "ith" element of str to the "jth" element of rstr. The notation "i – –" says to subtract 1 from i after using it as an index to str. Similarly, "j + +" says to increment j after using it as an index to rstr. If the "– –" or "+ +" appear before a variable, e.g. "– – j", it means to decrement or increment the variable before using it.

When i is decremented below zero, the loop is done and the string in str has been copied backwards into rstr. An EOS character is then stored at "rstr[j]" to terminate rstr. The "}" character marks the end of the function.

Every C program must include a function called "Main"; this is where execution begins when the program is run. "Main" always has two arguments, "argc" and "argv[ ]." "Argc" tells how many arguments are on the command line which invoked the program; "argv[ ]" is an array containing addresses of the command line arguments themselves.

The example C program's main function defines two character arrays "line" and "rline", both dimensioned to have "strlength" characters. "Puts" is another C library function, standing for "put string." It writes its argument to STDOUT, normally the CRT screen. Here it prompts the user to "Type a line: ". The argument to "puts" is a literal string enclosed with double quote marks. The compiler stores the string and terminates it with an EOS byte.

The next call is to the function "putchar," which writes a single character to STDOUT. In this case, the EOL or End-Of-Line character is written, forcing the cursor to move to the next line on the screen. EOL is defined in stdio/h.

The "gets" function is called to get a string from STDIN. The resulting string is stored in the variable "line." This is followed by a call to revstr to reverse the string in line and store the result in rline.

Finally, "puts" and "putchar" are called again to type the closing message and rline, the reversed string. ■

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continued from p. 199

make program development and maintenance easier. When the hassle of compiling a program outweighs the benefits of using the language, why bother?

You must do the first extra step in Fig. 2 because the text editor, Scripsit for example, doesn't allow you to type in C's special characters. You can have this problem whether you are using EDTASM or M80. Intersoft supplies a preprocessor that translates two-character "escape sequences" into the "special" characters. For example, "(." and ".)" are converted into "[" and "]", respectively. The preprocessor executes quickly (it is written in C and compiled to machine language) but it adds an extra step to every compilation. Intersoft has informed me that the next version of their compiler will directly recognize the escape sequences as alternates for the special characters, eliminating the preprocessor step.

The next inconvenience comes when you run the compiler. You must supply a "starting number for labels." The compiler generates assembler source code labels of the form "CCxxxx", where "xxxx" is a sequence number starting with the one you specify. If your program contains separately compiled modules, the burden is on you to make sure that there are no duplicate labels in the separate modules that must be assembled all together. There are no guidelines given for how far apart the starting numbers should be. It is totally dependent upon how many labels the compiler has to generate to compile a particular program.

The compiler generates a Z80 source code file that is not yet in EDTASM-compatible format, strange considering this is supposedly the EDTASM-compatible version of the compiler. You must run a postprocessor which adds line numbers and some header and trailer information that EDTASM expects. The postprocessor step takes about as long as compilation. It also produces an output file that is larger than the already big assembler source file. Running it on the 19.5K byte C run-time support library creates an output file of 26.5K bytes. I use two 40-track double-density disks that fit well. A user with one 35-track single-density drive would really be cramped.

The next step is to run EDTASM and load the assembler source code files produced by your separately compiled modules. In the original release of the compiler, you had to load the sources for the C run-time support library into EDTASM's buffer, too. With a 48K byte machine, I only had 4K bytes of free space left in EDTASM after loading all the sources to assemble the short sample program in the listing. The compiler generates several consecutive blanks in each line of assembler source code it produces. By replacing consecutive blanks with single blanks, I squeezed out an extra 4K bytes of free space.

An update notice to the system describes a procedure that helps alleviate this memory crunch. You make a few minor changes to the support library source code, then compile and assemble the result, producing a core image file containing the executable version of the run-time library. You must also create a file of assembler EQU (equates) statements that associate a symbol with a hexadecimal address—one statement for each of 36 entry points in the run-time library.

When you compile a C program, you load the compiler output together with the EQU file into EDTASM and assemble it. The output of EDTASM is combined with the executable version of the

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support library by loading everything into memory and dumping it back out as a single file using TRSDOS's Dump command. This allows you to write somewhat larger C programs, but still not nearly as large as with M80.

The manual suggests a tedious, unnecessary method of combining assembler source-code files in EDTASM's buffer: Load a file, write down the highest line number, then load previous files and renumber them to avoid line number conflicts, reload the first file, and so on. EDTASM lets you combine files that have conflicting line numbers, as long as you issue the N (renumber) command immediately after loading such a file. This command renumbers the whole file into one with nonconflicting line numbers.

There is a possibility of having multiple End and ORG statements in your file, since one is produced for each separately compiled module. Intersoft suggests searching the entire file using the F (find) command and deleting all but the first ORG and the last End statement. After doing this, you can finally use EDTASM's A command to create an executable code file on disk.

There is considerably more work to do in Fig. 2 than the diagram suggests. Much of the additional work is manual and tedious. You are limited to compiling much smaller programs if you use EDTASM, and there is a bigger demand on disk space. Keep in mind that you have to go through all these steps every time you have to recompile to correct a bug, or add a feature. I consider the compiler and EDTASM to be a very poor match.

I also take issue with the claim in Intersoft's advertising that no knowledge of Assembly is required. Using the assembler is an integral part of compiling a C program. Only partial instructions are given for using either M80 or EDTASM. At one point, the manual states: "You may find odd errors appearing when you attempt to assemble. A careful examination of the source code in memory will usually reveal the nature of the problem..." How can you examine assembler source code to find a problem if you don't understand Assembly?

On the positive side, no royalty payments are required if you are interested in selling the software you develop with Intersoft C.

Language Features

As I mentioned, Intersoft C is not a complete implementation of the C language. If you are familiar with how Radio Shack's Tiny Pascal compares to full Pascal, you will have some idea of how Intersoft C compares to full C. Intersoft C is ahead of Tiny Pascal in several areas; it supports disk I/O, separately compiled modules, and integrated Assembly code.

Specifically, version 2.0 of Intersoft C does not provide:

- Long (32-bit) integers or floating-point numbers (the only data types supported are characters and 16-bit integers);
- Multi-dimensional arrays (only one-dimensional arrays are allowed);
- Structures, unions, typedefs, and storage classes;
- The "sizeof" operator;
- "Casts" (explicit data type conversions);
- The GOTO statement; and
- Compile-time initialization of external variables.

Intersoft says that version 2.5, not available at the time of this writing,

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does have the following features, which were not in 2.0:

- The comma operator;
- Assignment operators (you must say X=X+1 instead of X+=1, X=X*2 instead of X*=2, and so on);
- Conditional assignment—you must say:

```
if (x>0)
  y=1
else
  y=2
```

instead of full C's conditional expression:

```
y=(x>0) ? 1 : 2
```

- The "&&" and "||" logical AND and OR operators, "&" and "|", C's bitwise AND and OR operators, are provided; in practice, this usually means that you have to use more parentheses, e.g.:

```
(( x==0) & (y==0))
```

instead of full C's:

```
(x==0 && y==0)
```

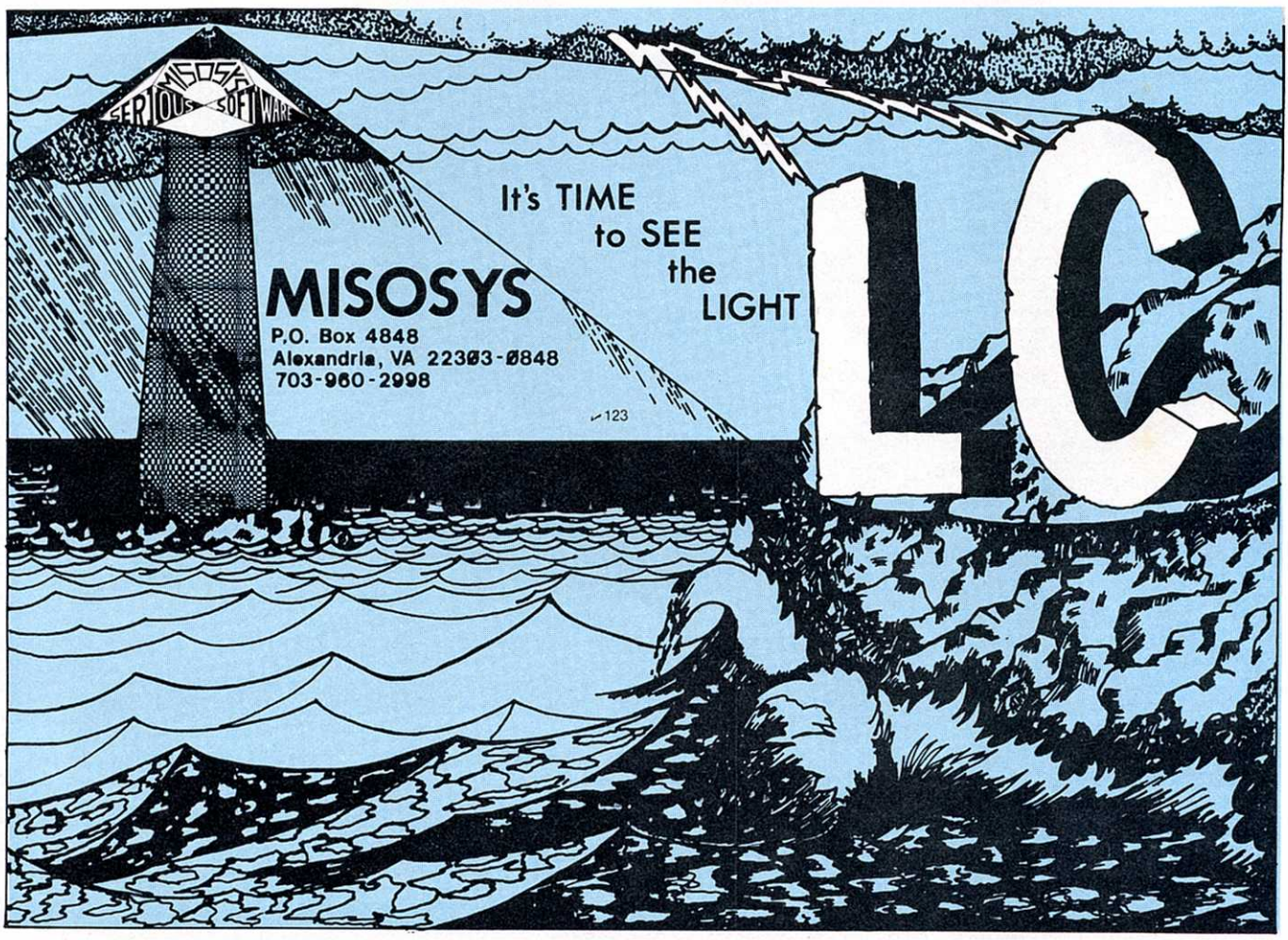
On the plus side, the compiler does support:

- All the standard C control structures except GOTO: for, while, if...else, do...while, switch, break, continue, and return;
- Pointers to characters and integers and full pointer arithmetic;
- Functions being passed as arguments to other functions;
- Hexadecimal and octal constants entered in a C program;
- #include <file>, a directive to the compiler that can be placed anywhere in a program, telling the compiler to read the specified file, compile its contents, and then resume the original file from the next statement. (#include does not work under TRSDOS on the Model I. Intersoft says this is due to a TRSDOS bug, but I have other compilers that provide an include feature that does work under TRSDOS);
- #define <constant> <value>, allowing definition of a constant at compile time; and
- "#asm" and "#endasm", directives to the compiler that the code in between these two statements should be passed through unchanged to the assembler. This lets you "drop into" Assembly at any point in a C program. The manual tells how to pass data between a C statement and Assembly code.

The C compiler distinguishes identifiers as long as they are unique in the first nine characters. External identifiers are limited by whatever your assembler allows (in most cases six characters).

The compiler flags errors as it finds them in a C program and writes English error messages to the output file together with the offending C statement. It seems to do a good job of recovering from detection of an error and continuing compilation, although sometimes one C program error can result in several error messages.

Although there is no cross-reference facility built into the compiler, if you use the M80 assembler, you can use Microsoft's CREF80 cross-reference program. There are no special debugging aids. You can use Put statements to write messages at strategic points in a program, or use an Assembly-language debugger together with the Assembly source-code output produced by the compiler. There is no built-in way to pause a running C program, such as the shift-@ convention of TRS-80 Basic.



File Handling

Intersoft C provides some nice features borrowed from UNIX's command-line interpreter. If your program uses the standard C library routines to read and write characters, you can redirect I/O to a file or files at run-time. The standard input for C programs, called STDIN, defaults to the keyboard. The standard output for C programs, called STDOUT, defaults to the CRT screen. You can redirect STDIN to a file by including "<file name" on the command line; you can redirect STDOUT with ">file name".

To illustrate this feature, a simple C program called CPY is provided. All CPY does is copy data from STDIN to STDOUT, but command line redirection of STDIN and STDOUT makes CPY very versatile. If you run it by typing "CPY" from the DOS ready prompt, everything you type at the keyboard is echoed on the screen.

"CPY <testfile" lists the contents of "testfile" on your screen, just like the TRSDOS List command.

"CPY <testfile>backup" copies "testfile" to "backup". If "backup" does not exist, it is created.

"CPY >newfile" puts everything you type at the keyboard into newfile; this is an easy way to create a short text file.

This is not all; by using ">>file name" instead of ">file name", output will be appended to the file rather than overwriting it. The append function does not work properly in TRSDOS 2.3 due to a DOS bug, but it does work with most alternate TRS-80 DOSes.

I was favorably impresssed at first by the way Intersoft C lets you open files from within a program without requiring you to specify in advance how many files your program will be using. Then I looked more carefully at the code for file opening and discovered a potential hazard. Memory is allocated for a file buffer and FCB (file control block) when a file is opened, but this memory is not released when the file is closed.

This means that every time you open and close a file, you have eaten away at free memory to the tune of 288 bytes. Intersoft says that version 2.5 of the system will have a dynamic memory allocation and deallocation scheme that will avoid this problem.

Although Intersoft C allows you to open a file in a random-access mode, there is no language support for reading and writing random file records. Sequential input and output to files is supported.

Performance

The C compiler is reasonably fast; it reads its source from disk and writes its output back to disk as it compiles. Running under LDOS and putting my input and output files on separate disk drives, a 360-line program took three minutes to compile, a rate of 120 lines per minute. It took another three minutes to run M80 and L80 to complete the process, totaling six minutes, or 60 lines per minute. This includes the time required to load the compiler, M80, and L80 from disk and type in the responses to the prompts.

It took two minutes to compile, assemble, and load Program Listing 1. The executable /CMD file produced was 4,500 bytes long. This is pretty compact for a file that can be run by itself, compared to what some microcomputer compilers produce.

The run-time speed of Intersoft C programs is impressive. A benchmark

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program I ran that computes prime numbers using the Eratosthenes sieve algorithm ran in 123 seconds on Intersoft C, compared to 4470 seconds on Disk Basic! This is certainly a big improvement. All the C programs I ran seemed to be snappy, much closer to Assembly than to Basic programs in speed.

Documentation

The documentation for Intersoft C earns a grade of C. The manual says it's not trying to be a tutorial, but I didn't find it to be very successful as a reference manual, either.

It's hard to be harsh on a manual that is written in a friendly, easy-going style, but in my opinion its omissions are unconscionable. For example, even though the manual is 94 pages long, there is no complete description of the Intersoft C language. If you are expected to own or purchase a book in order to use a product, the advertisement for that product should clearly state this. Unless you can write C programs in your sleep, you will absolutely need a book such as Kernighan's (referenced earlier) to use Intersoft C.

About half the manual consists of source-code listings of the various support libraries and functions provided with the package. However, there are no instructions on how to use these functions. There are some comments in the listings, but you need Kernighan's book to discover how to open a file, use the string functions, and read and write characters.

There is no index and only a very brief table of contents—it's not particularly helpful to know the section number corresponding to each of the five appendices without knowing what's in them!

Enough information is provided for the technically minded to determine how to interface Assembly routines with C programs. Restrictions and enhancements to full C are explained.

Conclusions

Despite its shortcomings, Intersoft C is a useful product. It allows you to build libraries of functions that you can combine to create new programs with relative ease. I have used the package frequently and I have yet to find anything that does not work as documented.

Based on the manual, the folks at Intersoft sound sincerely interested in supporting and improving their product. In several places they ask users to send suggestions and notify them of any bugs. They say that updates will be available but no specific update policy is described. Intersoft has stated that a $15 charge will allow the EDTASM version owner to upgrade to the M80 version of the product.

I feel that Intersoft C is somewhat overpriced considering the other software you must own to use the package, and comparing what you get to what some other TRS-80 compiler packages offer in its price range. If you already have the M80 assembler and linking loader, plus a text editor that lets you enter C's special characters, I can recommend Intersoft C with the reservations noted in this article. I personally consider the combination of Intersoft C and EDTASM to be unacceptable. ■

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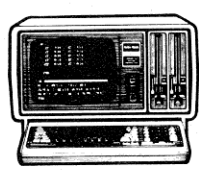

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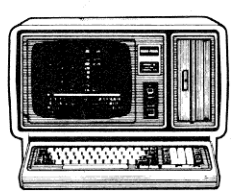

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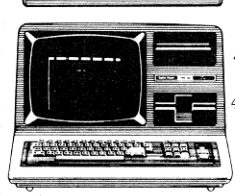

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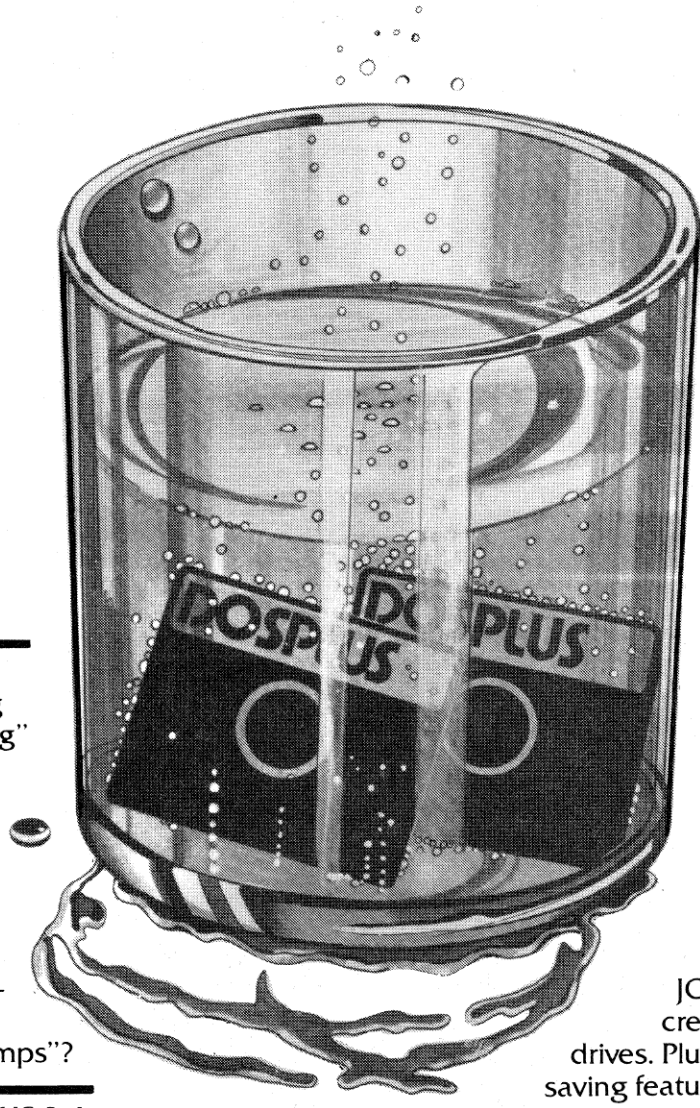

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Michael's Game

by Nancy Modney

Your children don't have to grow up afraid of micros. Start them off early with this game program that teaches letters and numbers.

Skeptical friends and family members often ask me what in the world I use a home computer for. I have at least one answer—it helps my child learn.

From the time David and I brought our son home from the hospital, his life has been filled with the sights and sounds of our TRS-80. The spare bedroom of our apartment had been the official computer workshop. When I discovered my pregnancy, a small crib and changing table were slipped into one corner. My hopes of a frilly pastel nursery were quickly dashed. Michael's bedroom was decorated in shades of software!

When Michael was an infant, David would prop him up near the computer to watch. It was no wonder that Michael developed an intense interest in the TRS-80. As my son grew older, he was no longer content to remain passive. Michael wanted to play with his father's toy too!

"Why don't you write a program Michael can use?" I suggested to my husband. So he did.

The program is called Hear and See numbers, and the only instructions on the screen display is "Push any Key." Each time Michael pushes a numeric key, that number is shown on the screen. Then that many boxes appear, one by one. Each rectangular box is accompanied by a beep through an amplifier connected to the cassette-out jack. (This is optional—the program can run without sound.) For example, Michael presses the 5 key. A number 5 appears on the screen, and five boxes are drawn, one at a time (with beeps). When he presses the 0 key, no boxes appear.

Of course, our little boy doesn't press only numeric keys. When Michael pushes a letter key he sees that letter.

How the Program Works

Lines 10–50 are remark statements. Lines 60–90 set up the constants. Line 110 puts the computer into enhanced mode so the letters will be in large type for easy reading. Lines 120–140 name the program Hear and See Numbers, and print the instructions on the screen.

The program then drops through to line 290, beginning the first major routine, which determines if any key is pressed and analyzes what it is. Line 290 strobes the keyboard, looking for a key stroke. Notice that in line 300 there is no space between the quotation marks. If A$ has no value, then no key has been pushed and the program returns to line 290. Until a key is pushed, the program continues in this loop between lines 290 and 300.

If a key is pushed, the program then goes to line 310 to check if the key is a number greater than zero. If a letter or zero key was pushed, the computer goes to line 320, prints the letter on the screen, and returns to line 290.

If the key pressed was a number, the program goes to line 160 for the second major routine. Line 180 prints the number on the screen. Line 200 determines the number of boxes needed. Line 220 makes a buzz for each box counted. The program loops through this box-and-buzz routine enough times to equal the value (number) printed. The program then returns to line 290 to await another keystroke.

For Technical Buffs

Here is a more technical description of how the program makes sound. Lines 70 to 90 set up the constants P = 255, U = 9, and D = 10. P is used as a port number. In this case, port number 255 is the cassette port. U and D are numbers sent to port number 255. The number U sends the cassette port output high (up). The number D sends the cas-

The Key Box

Model I or III
16K RAM
Cassette or Disk Basic
Cassette jack amplifier optional

sette port output low (down). If the cassette output is sent low and high in rapid succession, the result is a square wave. When this square wave is amplified, a buzzing sound is created. Line number 220 sets up a sequence of 31 rapid low/highs sent to the cassette port. This occurs for each box counted on the screen. Line 220 is composed of multiple Basic statements (separated by colons) to help speed up the low/high buzz operation. Lines 230 and 240 provide a small time delay between boxes.

Conclusion

The buzzing is optional, but Michael lost interest more quickly when the sound was turned off. The audio is excellent feedback for a young child. If you don't have an amplifier, Radio Shack offers one for $11.95 (catalog #277-1008).

Not only does Michael (age 2½) like this program, but his cousin (age 5) enjoys using it too. It's a big hit when children come to visit. ■

Nancy Modney, and her son Michael, can be reached at 4144 N. Via Villas, Tucson, AZ 85719.

```
10 REM ** HEAR AND SEE NUMBERS ... FOR TRS-80 MODELS 1 @ND 3 **
20 REM ** NANCY MODNEY, 4144 N. VIA VILLAS, TUCSON  AZ 85719 **
30 REM ** WRITTEN BY HUSBAND DAVID FOR SON MICHAEL D. MODNEY **
40 REM ** AUDIO AMPLIFIER IS OPTIONAL **
50 REM ** HOOK UP AUDIO AMPLIFIER TO GRAY CASSETTE OUT JACK **
60 DEFINT B-Z
70 P=255
80 U=9
90 D=10
100 CLS
110 PRINT CHR$(23)
120 PRINT "HEAR AND SEE NUMBERS"
130 PRINT
140 PRINT "PUSH ANY KEY"
150 GOTO 270
160 CLS
170 PRINT CHR$(23);
180 PRINT VAL(A$)
190 PRINT
200 FOR X = 1 TO VAL(A$)
210     PRINT CHR$(191)"  ";
220     FOR Y = 0 TO 30 :OUT P,U :OUT P,D :NEXT Y
230     FOR Y = 0 TO 100
240     NEXT Y
250 NEXT X
260 PRINT
270 PRINT
280 PRINT
290 A$ = INKEY$
300 IF A$ = "" THEN GOTO 290
310 IF VAL(A$) > 0 THEN GOTO 160
320 PRINT A$"  ";
330 GOTO 290
```

Program Listing

WORD PROCESSING ON YOUR TRS-80 BECOMES CHILD'S PLAY WITH

Using Scripsit

by William James Haga

320 pages, 8½" x 11", Illustrated, Paperbound, $21.95, 1983.

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by Doug Biedenweg

Got an old refrigerator lying around? This unit will let you control its lighting and temperature for all sorts of science projects.

Researchers need to simulate the temperature and light of various natural environments to properly study the lives of plants and animals. This micro-controlled incubator provides a means to do so.

First, you need to build a temperature and light-controlling input/output device. This interfaces a TRS-80 Model I to a standard home refrigerator. The I/O device regulates a heater-fan module and a bank of fluorescent lights.

This system has many possible uses. For instance, botanists can produce the oscillations in temperature that many seeds require to germinate, and can study plant growth under various temperature and light conditions. Bacteriologists and mycologists can study microbial colonies in situations close to those found in nature. This is particularly useful when studying food spoilage. Herpetologists can control body temperature cycles in snakes or lizards, and measure the effects these cycles have on digestive rates.

At home, the system will produce optimal conditions for terrarium. If connected to a small floor heater, it can save electricity during the winter months.

The Key Box

Model I
16K RAM
Level II Basic
Incubator

Materials and Methods

You'll need 16K and Level II Basic. Fig. 1 shows the schematic for the interface device. Table 1 is a parts list.

The device uses a 4047 as an astable multivibrator, with a thermistor in the RC circuit, to produce an output frequency that is a function of temperature. This output of the 4047 feeds into the computer via the cassette port. The thermistor must be calibrated in the circuit, so that the circuit's output frequency can be converted to a temperature.

The cassette auxiliary line is the output line from the computer to the heater circuit. The program (Program Listing 1) will make this line go high or low. When V=0 or 1, OUT 255,V makes the output 0 V dc. When V=4 or 5, OUT 255, V gives 0.85 V. When the output is high (0.85 V), the plus input voltage on the 741 rises above the 0.6 V set by the forward biased diode at the minus input. This causes the output of the 741 to go high, which closes the heater relay.

I used a double-relay system to the heater in our incubator to prevent the incubator from becoming too hot if the computer malfunctioned. The second relay was in series with the computer-controlled relay and its state (opened or closed) was determined by a bimetallic thermoregulator housed in the heater/fan assembly. The bimetallic thermoregulator was adjusted so that the relay would open and the heater turn off at temperatures above 40 °C. The heater and fan ran independently. The fan ran continuously.

The ouput line from the computer to the light circuit (Fig. 1) is run from the computer cassette relay. The cassette relay can be closed under program control. When the relay is closed, enough current flows into the base of transistor Q3 to power the closure of the R_2 relay, which will remain on until the cassette relay is opened.

Programming the Computer

The computer reads the temperature of the thermistor by measuring the period of the astable multivibrator using

the "ear" port to input the signal. A machine-language program (Program Listing 2) allows the computer to determine the period of oscillation. The machine-language program is called from the Basic program (Listing 1), which also controls the incubator. Program Listing 3 is a Basic program that POKEs the machine-language program into high memory, where it is

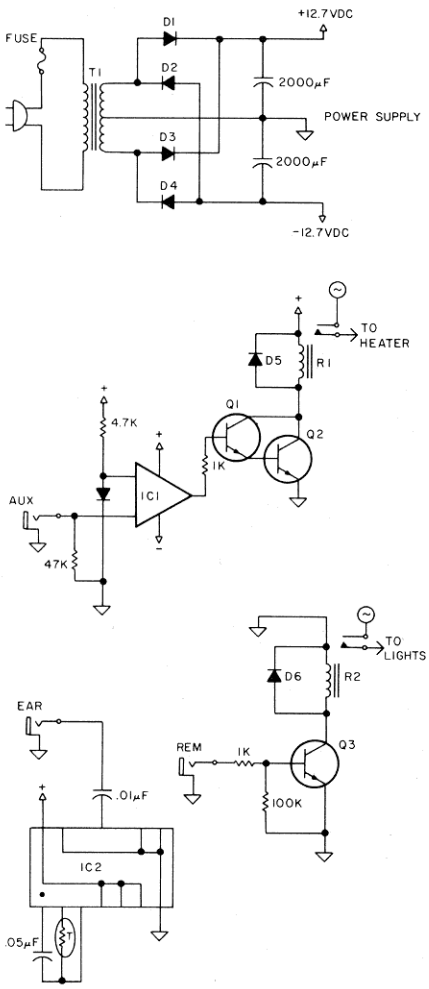

Fig. 1. Schematic of I/O Device that Interfaces the Computer to the Incubator

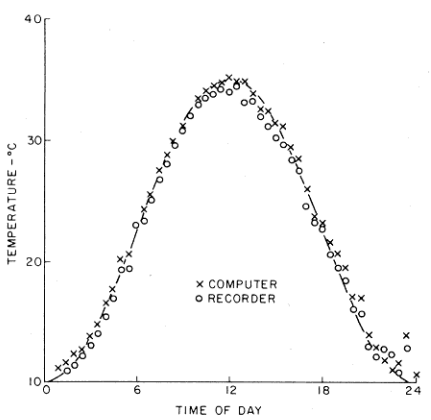

Fig. 2. Comparison of Specified Incubator Temperatures to those Measured by the Computer as an Independent Recorder

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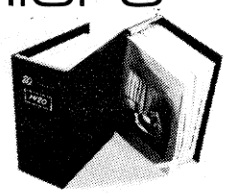

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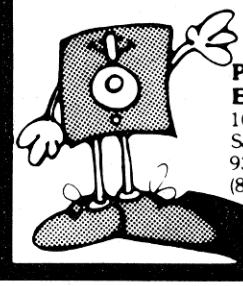

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From the January 1981 issue of the CSRA Computer Club newsletter:
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used by Program Listing 1. You reserve space in memory for the machine-language program by entering 32511 when the computer requests the memory size. You then load and run the machine-language subroutine and the main program.

Program Listing 1 produces a sinusoidal temperature pattern (range 10–35 °C) with 16 hours of light and eight hours of darkness. Line 20 is the start of a one-minute loop that counts to 1,440 minutes, the number of minutes in a day. Lines 22 and 24 are a loop that just wastes time, allowing the loop that starts in line 20 to equal a minute in duration. Line 30 POKEs the address of the machine-language subroutine into the memory for use by the USR command. Line 40 calls the machine-language subroutine, which tells the Basic program the frequency of the output of the oscillator, X, and allows the computer to convert this output to a temperature in line 100.

The equation in line 100 is simply a polynomial curve fit of the thermistor/oscillator-pulse-output-(X)-versus-temperature (°C) curve. The constants in this equation must be obtained to fit the particular thermistor used. Line 90 defines the 24-hour temperature cycle that you desire in the incubator. In this program, TI, as a function of time, is sinusoidal and oscillates between 10 and 35 °C. The equations in lines 110–140 control the heater and lights in the incubator. If TM is less than or equal to TI, then the heater turns on. If S is less than 960 then the lights turn on. Following logically from this, when lines 110–140 set V to equal five, both the lights and the heater will turn on; when V equals four, the heater will be on while the lights are off; when V equals zero, both the lights and the heater will be off; and when V equals one, the lights will be on and the heater off. This is the information conveyed to the interface via the OUT statement given in line 160.

To modify the temperature cycle in the incubator, you simply change the equation in line 90. If you modify any part of the program, however, change the time-wasting loop in lines 22 and 24 to set the period of the loop that begins in line 20 equal to one minute. If your heater is more powerful than the one used here, or you want to control temperature more precisely, the loop that starts in line 20 can be sped up and TM can be assessed and compared to TI more frequently. The heater will then stay on (and off) for shorter periods of time and temperature fluctuations within the incubator will be smaller. If the loop, which starts at 20, is sped up, obviously you'll have to modify all facets of the program involving S to maintain a 24-hour cycle.

You can create a variety of special effects with the computer. You can simulate sun flecks by throwing random components into the main program that will turn the lights off for brief periods during the day. A random component to the temperature variation can also be simulated, or actual outdoor temperature can be read from a tape and used for control levels. You can also program the computer so that the photoperiod within the incubator will change over time to simulate fluctuations in day length. The number and types of photo and temperature cycles that the computer can set up and control is only limited by the imagination of the programmer.

```
  5  CLS
 10  V=0
 20  FOR S=1 TO 1440
 22  FOR J=1 TO 19883
 24  NEXT J
 30  POKE 16526,0: POKE 16527,127
 40  X=USR(V)
 90  TI=12.5*SIN(1/720*3.14159*S-3.1459/2)+22.5
100  TM=5128.69-6.37239*X+2.96413E-3*X↑2-6.12687E-7*X↑3+4.76548E-11*X↑4
110  IF TM<=TI AND S>960 THEN V=4
120  IF TM<=TI AND S<960 THEN V=5
130  IF TM>=TI AND S>960 THEN V=0
140  IF TM>=TI AND S<960 THEN V=1
160  OUT 255,V
170  PRINT S,TM,TI
180  NEXT S
190  GOTO 20
```

Program Listing 1. Basic Program for Control of Temperature and Light Cycles in the Incubator

Item	Quantity	Description
Capacitors	2	2000μf 16 Vdc electrolytic
	1	0.01μf ceramic
	1	0.05μf polystyrene
Diodes	6	1N4003
	1	1N914 (for 741)
Transistors	3	2N2222 NPN
Resistors	1	47000Ω
	2	1000Ω
	1	4700Ω
	1	100,000Ω
Relays	2	100Ω 12 Vdc W88 CPX:6
Transformers	1	Triad F203U Pri 110 Vac Sec 27 Vac-CT
IC chips	1	CD 4047 Monostable/astable multivibrator
	1	741 CP General-purpose operational amplifier
Sockets	1	14 pin IC
	2	8 pin IC
	1	wall
Thermistor	1	1 MΩ @ 25 °C glass probe
Heater/fan assembly	1	Cenco refrigerating incubator—Model 46042 330 W (measured)
Jacks	2	subminiature 1/16″ phone plug
	1	
Grounded wall plug	1	
Mounting board	1	
Box	1	9″×6″×5″

Table 1. Parts List for Interface Device

Results and Discussion

Figure 2 compares setpoint temperature (TI), the temperature measured by the computer (TM), and the temperature measured by a thermistor operating independently inside the incubator.

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The independent thermistor showed that the I/O device thermistor readout (TM) was within ±3 °C of the set point temperature. The timing cycle was within 0.5 s in 24 hours. These results indicate that this interface is capable of temperature and light control in a simple incubator. ■

Doug Biedenweg can be reached at the Biological Field Station, Lake Itasca, MN 56460.

```
        CALL 0A7FH;GET USR PARAMETER
START:  DI;DISABLE INTERRUPT
        LD(STAT),HL;STORE USR PARAMETER
        PUSH BC;SAVE REGISTERS
        PUSH AF
        CALL RESET;RESET CASSETTE LATCH
        LD HL,1000H;LOAD TIMER COUNTER
GB1:    DEC HL;DECREMENT COUNTER
        LD A,H
        OR L;CHECK FOR ZERO
        JR Z,REST;IF NO PULSE, QUIT
        IN A,255);INPUT FROM PORT
        RLA;GET HI BIT
        JR NC,GB1;TRY AGAIN IF NO PULSE
D1:     LD B,10H;WAIT
        DJNZ $
        CALL RESET;RESET LATCH
        LD HL,1000H;LOAD TIMER COUNTER
D2:     DEC HL;DECREMENT COUNTER'
        LD A,H;CHECK FOR
        OR L;ZERO
        JR Z,REST;FINISHED IF ZERO
        IN A,(255); INPUT FROM PORT
        RLA;GET HI BIT
        JR NC,D2;TRY AGAIN IF ZERO
        LD B,H;SAVE REST OF COUNT
        LD C,L;IN B,C
D3:     DEC BC;THIS LOOP IS JUT
        LD A,B;TO WASTE TIME
        OR C;EQUAL TO THE PORT
        JR Z,REST;INPUT TIME UNTIL
        IN A,(255);1000H COUNTS ARE
        RLA;FINISHED
        JR NZ,D3
REST:   POP AF;RESTORE REGISTERS
        POP BC
        JP 0A9AH;RETURN TEMP TO USR
RESET:  LD A,(STAT);GET USR PARAMETER
        OUT (255),A;OUTPUT IT
        RET
STAT:   DW OH
        END
```

Program Listing 2. Machine-language Subroutine to Measure Incubator Temperature

```
 10  FOR I=32512 TO 32581
 20  READ A
 30  POKE I,A
 50  NEXT
 60  DATA 205,127,10,243,34,68,127,197,245,205
 70  DATA 62,127,33,0,16,43,124,181,40,37
 80  DATA 219,255,23,48,246,6,16,16,254,205
 90  DATA 62,127,33,0,16,43,124,181,40,17
100  DATA 219,255,23,48,246,68,77,11,120,177
110  DATA 40,5,219,255,23,32,246,241,193,195
120  DATA 154,10,58,68,127,211,255,201,0,0
```

Program Listing 3. Basic Program for POKEing Machine-language Subroutine into High Memory

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Son of Pilot

by Randy Hawkins

If you've wanted to use Pilot, but it did not work on your system, try this altered version.

Son of Pilot is a rewrite of "Pilot—The Language of Computer-Aided Instruction," which appeared in the July 1981 issue of *80 Micro*. The original version was only usable on a cassette-based Model I. Son of Pilot should work on any TRS-80 system—any model, any memory size, and either cassette or disk based.

Pilot (Programmed Inquiry, Learning, or Teaching) is a simple, easy-to-learn language that is useful in education. Pilot lets you construct lessons that present information to students on the computer video display, ask questions to test for comprehension, and jump forward or backward in the lesson. Dr. John Starkweather developed Pilot's structure around 1970, and it has been implemented on many small computer systems.

The Basic Program Listing 1 POKEs the Pilot interpreter into high memory of any TRS-80. This program takes the place of the System tape created in the earlier article. To use Pilot, type in the program. Before you run the program, CSAVE it to tape or save it to disk, because any error in the program could cause your computer to return to the memory-size or cassette prompts or reboot the disk.

A method of checksums is used, so if you make a typing error, you are notified which line contains the error. Although the program POKEs numbers into high memory, you need not worry about setting the memory size, because it is handled automatically. As the program runs, you can see the line numbers advancing with the on-screen message. The program deletes itself in line 390 when completed.

The Pilot interpreter in Listing 1 is similar to the one from the earlier article—only the method of entry has changed. If you are successfully using the original version, you don't need to discard it and switch to this one. Both interpreters function exactly the same.

If all goes well as you type in the program, what has been accomplished? When you load a Basic program into memory and type run, the Basic interpreter located in ROM examines your program and acts on the individual commands. Basic is an interpreter that translates keywords like Print, For... Next, and If...Then into actions. Similarly, the short machine-language Pilot interpreter located in high memory also translates your Pilot programs into actions. Since Run is already used as the Basic go signal, Pilot uses the Name command as the signal to begin execution. Name is a Basic keyword that is not used for any important function.

Although the Pilot commands are explained in the original article, Program Listing 2 illustrates them and presents a sample program. Type in the program using the standard Level II input and editing features. When the listing is correct, type "NAME" and execute the program.

Each Pilot statement is numbered. The numbers can be any value from 0 – 32767, and the gaps between statements need not be regular. The numbers serve two purposes—to put the commands in order from first to last and to serve as reference points when a jump is made from one point to another. Following each number is a letter and a quotation mark. The letter identifies the type of statement, and the quotation mark isolates it from the rest of the line. (Some versions of Pilot use a colon rather than the quote; if you wish to use Pilot programs written for other systems, simply substitute the quote for the colon.)

The C command means "clear the screen and print the message that follows." The A command stands for "ask the question that follows." When the A command is found, the question is printed on the screen, a question mark is added, and the computer waits for the student to type in his answer and press enter. The student's answer is stored in a special temporary memory of the TRS-80. It can be reprinted on the screen by using the @ symbol in any other message. The W command means "clear the screen, and print the following message in wide letters."

The sample program gets the student's name in line 20, the screen is cleared and switched to wide letters in line 30, and the name is reprinted as "Hi Bobby!" using the @ symbol in the same line. The T command means "type the following message on screen." Following a question in an Ask command, you'll usually want to match the answer with the correct value. This is done in lines 70, 90, and 110. Line 70 illustrates that when several acceptable answers exist, they can be listed in the match statement separated by slashes; if any one answer is correct, then the match is successful.

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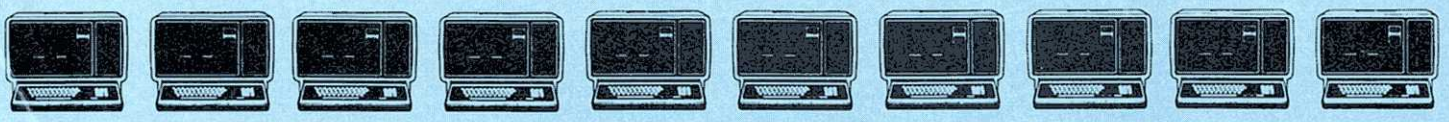
433



The program can jump forward or backward with the J command. As shown in line 150, the J is followed by the line number that you want to jump to. An E command signals the end of the program.

When a match is made with the M command, the TRS-80 asks itself, in effect, "Does the student's response match the correct values listed here in the M statement?" If the answer is yes, then any command preceded by the letter Y is performed; any preceded by an N for no will be ignored. Conversely, if the match gives a no answer, the N commands are performed. So, if the student answers 2, line 100 will be typed. Any command can be preceded by a Y or N. When they are preceded with the yes/no conditional, the answer to the most recent match statement is used as the basis for skipping or executing that statement.

Pilot is easy to learn. Because it has a simple structure, you don't need to worry about the mechanics of programming. Instead, you can concentrate on the lesson.

Many teachers and parents use Pilot to teach students a wide variety of subjects. However, many students also use Pilot to learn about computer programming. Pilot is an excellent first language for children. Since they are not overwhelmed by a large number of commands and rules, they can begin writing their own programs in less than an hour. Pilot teaches them to break a program idea into a series of smaller steps.

Any time you want to use Pilot to write a new program or to execute an old one, the procedure is the same. First, load the Basic program of Listing 1 and run it. This provides the TRS-80 with the special information it needs to translate Pilot programs into action. Next, load the desired program or type in a new one. Use the Name command to begin Pilot execution. You do not need to reload the interpreter of Listing 1 unless you return to the memory-size or cassette prompts, or turn off the power. You can even switch over to Basic and run several programs. Unless these programs alter high memory by POKEing into that area, Pilot will still be available for execution with the Name command.

Here are some tips for creating your own Pilot programs. Remember, when another user loads and runs your program, he might answer every question in lowercase, uppercase, or a combination of letters. Try to anticipate these combinations in your match statements. For example, even a simple yes or no question might look like this:
100 M"YES/yes/Yes/Y/y

If your program is too long to complete in one session, provide the option to skip over lesson units at the beginning of the program. If units 1, 2, and 3 begin at lines 1000, 2000, and 3000, then

```
10 M1=PEEK(16561)+256*PEEK(16562)-350:MS=M1+65536*(M1>32767)
20 POKE16561,(MSAND255):POKE16562,INT(M1/256):CLEAR50
30 M1=PEEK(16561)+256*PEEK(16562):MS=M1+65536*(M1>32767)
40 S1=M1+45:SS=S1+65536*(S1>32767)
50 POKE16783,(SSAND255):POKE16784,INT(S1/256):MS=MS+2:LI=110
60 CLS:PRINT@266,"Loading PILOT Interpreter ... please wait"
70 LI=LI+10:READA$,CS:IFA$="END"THEN360ELSEFORI=1TOLEN(A$)STEP2
80 MS=MS+65536*(MS>32767):PRINT@403,"Poking DATA of line";LI
90 A1$=MID$(A$,I,1):A1=ASC(A1$)-48+7*(A1$>"@")
100 A2$=MID$(A$,I+1,1):A2=ASC(A2$)-48+7*(A2$>"@"):A3=A1*16+A2
110 POKEMS,A3:X=X+A3:MS=MS+1:NEXTI:IFX<>CSTHEN400ELSEX=0:GOTO70
120 DATA CDC901187BCDC9013E17CD2A03,1296
130 DATA 1871237EFE22205DE5C5237EFE,1552
140 DATA 002803CDA728CDB31BFE012812,1179
150 DATA C1E1184C2AA4400E59D5D13A40,1435
160 DATA 3BFE042003C3191A7EFE002320,1045
170 DATA 057EFE0028F2235E2356D5237E,1291
180 DATA FE592822FE4E281EFE542826FE,1489
190 DATA 4128B1FE4D285DFE4A2864FE45,1537
200 DATA 2852FE572897FE43288E1838B9,1422
210 DATA 28D5237EFE0020FA2318B1237E,1347
220 DATA FE222026E5C5237EFE002815FE,1514
230 DATA 402806CD2A032318F1E52AA740,1162
240 DATA CDA728E12318E63E0DCD2A03C1,1444
250 DATA E118CB210000CDA728E1CD9A0A,1491
260 DATA CDBD0FCDA728C3191A0E59237E,1331
270 DATA FE2220E5E51830237EFE2220DC,1551
280 DATA 23C5CD5A1E2AA4407DB4281B4E,1277
290 DATA 2346C5237EBB2803E118F0237E,1343
300 DATA BA2803E118E82B2B2BC1C11887,1384
310 DATA C118B223ED5BA7407EFE2F281C,1484
320 DATA FE002818EB46EBB82004231318,1156
330 DATA ED237EFE002806FE2F28DE18F4,1529
340 DATA 0E4EE118874552524F5220494E,1053
350 DATA 204C494E4500,328,END,0
360 MS=MS-65536*(MS<0):MS=MS-14:M2=INT(MS/256):M1=MS-M2*256
370 S1=S1+130:POKE(S1+65536*(S1>32767)),M1
380 S1=S1+1:POKE(S1+65536*(S1>32767)),M2
390 CLS:PRINT"TRS-80 PILOT Interpreter Ready":DELETE10-400
400 PRINT:PRINT"Checksum error in line";LI:STOP
```

Program Listing 1

```
10 C"This is a PILOT program.
20 A"What is your name
30 W"Hi @! Welcome to PILOT!
40 T"What kind of computer is this:
50 T"1-Apple   2-Atari   3-TRS-80
60 A"What is your answer
70 M"1/One/one/ONE
80 YT"Nope, not an Apple!
90 M"2
100 YT"Sorry, Atari is wrong!
110 M"3
120 YT"That's right!  Very good!
130 YJ"160
140 T"Please try again...
150 J"40
160 E"
```

Program Listing 2

```
10 A"Which unit (1, 2, or 3) would you like to begin with
20 M"1
30 YJ"1000
40 M"2
50 YJ"2000
60 M"3
70 YJ"3000
80 T"Please enter only the numbers 1, 2, or 3.
90 J"10
1000 T"This is unit 1.
1010 E"
2000 T"This is unit 2.
2010 E"
3000 T"This is unit 3.
3010 E"
```

Program Listing 3

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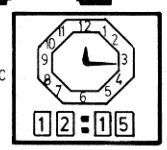

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include a section at the beginning of the program like the one shown in Listing 3. Remember that you cannot selectively begin Pilot execution at a particular statement. So, when you are writing and debugging a new program, and have already tested the section from line 10–1990, add a short line 1 J"2000 to jump past the debugged section and skip forward to the section of interest. Then, just before you save the new program to tape or disk, remove line 1.

Because this version of Pilot has only the minimum set of commands, think of it as a tiny Pilot interpreter. If you find Pilot useful, consider investing in a more complete version. Several are available, including one from Radio Shack. They include graphics options, tape and disk input/output commands, and other advanced features.

I would be glad to answer any questions you may have, but please include a self-addressed, stamped envelope with your questions or comments. ■

Randy Hawkins is a chemical engineer. He can be reached at 6214 Hidden Cove, Corpus Christi, TX 78412.

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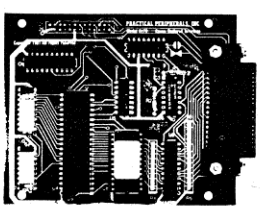

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Cassette Index

by Andrew Sensicle

With some reconstructed cassettes and this index, you can shorten your Color Computer's loading time to less than 20 seconds.

Apart from providing a convenient way to organize your programs on cassette, this article explains how to use the cassette more efficiently for program and data storage. Perhaps it will even help you resist buying that disk drive for another few months.

First, since you have only a few usable kilobytes of RAM use short tapes. I always buy the most inexpensive cassettes that are held together with screws. I take them apart and throw away the tape, saving the hubs. From a supply of good quality tape, I run two minutes worth of tape onto one hub, cut the tape, fasten it to the other hub, and reassemble the cassette. This yields a 16K-per-side "shorty" cassette that rewinds in 10 seconds, yet holds several short programs or a few long ones on each side.

Even with these diminutive tapes, one of my cassettes contains 12 programs and requires an index for rapid loading.

The essence of an index is speed. If an index forces you to wait to see what is on the tape, then forget it! I want to load a short program and about one screenful of characters in less than 20 seconds. The standard technique using PRINT#-1 saves or loads 500 bytes in 9–25 seconds, depending on how the data is presented, because the data is first loaded into a buffer and then dumped to tape in a block. Each block has a leader train of sync bytes as well as a pause to let the drive get up to speed.

This system has some definite advantages, but speed is not the greatest of them. The block can contain up to 254 bytes. However, the buffer often dumps when it is less than full. For large amounts of data the cumulative pauses and sync trains can add up to a significant amount of time. Anyway, I was already over my target.

You must record data in a block, but you can make a direct memory dump or core image of any specified size. This is the normal technique for recording machine-language programs, and it can be borrowed for the data storage as long as you know where the data is.

The program is in two parts. The first, Program Listing 1, is a general-purpose routine that sets up a string array of the desired size and pads it with space characters. It then obtains the memory locations of the array. With this house-keeping done, it loads data into memory or saves it from memory as if it is a machine-language program.

To do this reliably, set up the array in a predictable and immovable manner. Locate the setup routine before the main program, so the Clear statement won't affect other operations and also enable the placement of the array at the top of RAM. By defining the maximum number of records (MX) up front, you can easily make changes to accommodate more data. The POKE/PEEK in lines 110 and 130 let the value of MX survive the Clear statement. Predefine any variables used in obtaining the data address, since their subsequent creation changes the VARPTR value.

Strings are saved in memory from the top downward, so the lowest memory address is that of the highest element in the array. VARPTR for this element (line 180) then points to a location containing the length of that string element. The third and fourth bytes point to the actual location of the beginning of the string. All you have to do is PEEK those locations, calculate the two-byte address (line 190), then get the end-of-Basic-RAM address that is given in locations 39 and 40 decimal. If the main program makes USR calls to RAM routines or requires protected memory for other reasons, then the required address should be included in the Clear statement on line 120, as shown in the Color Computer manual.

The two parts of the program are shown together in Program Listing 2. In line 220, the data file INDAT is loaded for display and editing. The string data is modified using the MID$ statement (see line 320). The statement doesn't redefine the string but merely modifies it. It can't change in length, and it remains at the same memory location.

A few words are needed on the machine-language Save statement in line 420. The Color Computer manual is almost misleading in this respect. The only reference to CSAVEM is in the summary on page 192. It states correctly that CSAVEM has four parameters, but it incorrectly indicates that the first is a numeric variable and others are hexadecimal constants. In fact, the first parameter is the filespec and must be a string variable or a string literal en-

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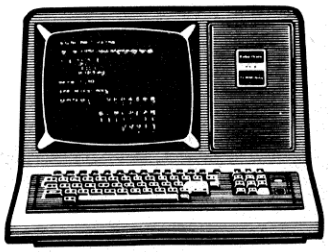

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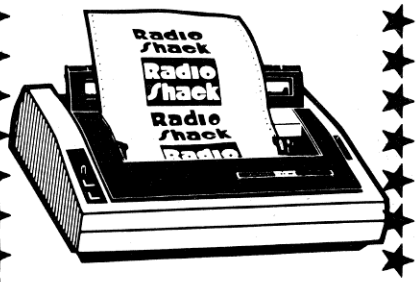

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closed in quotes. The remaining parameters can be either numeric variables or decimal constants separated by commas. They define the start, end, and execute addresses respectively. None of the parameters are optional, although the filespec can be a null string. For data, the execute address is meaningless; I use 350 (15EH), which contains a return, in case it gets executed by mistake.

Program Operation

After saving a file, as shown in line 600, CLOAD and run the program. Fourteen lines of index are displayed. Press any key to produce any additional lines. The "Enter Line No." prompt then appears.

If you need to add or change a line, type its number and press enter. If no number is given, the program exits. If additions or changes have been made, the program exits through a cassette save routine. ■

Andrew Sensicle can be reached at 119 Frost Drive, Whitby, Ontario, Canada L1P 1G1.


```
100  MX=13 'MAX RECORDS -1
110  POKE 500,MX
120  CLEAR MX*28+100
130  MX=PEEK(500)
140  P=0: ST=0: EN=0 ' PREDEFINE POINTER AND ADDRESS VARIABLES
150  DIM NX$(MX)
160  FOR X=0 TO MX ' FILL ARRAY
170  NX$(X)=STRING$(27,46):NEXT
180  P=VARPTR(NX$(MX)) ' GET POINTER
190  ST=PEEK(P+2)*256+PEEK(P+3) ' GET START ADDRESS OF ARRAY
200  EN=PEEK(39)*256+PEEK(40) ' GET END ADDRESS OF ARRAY
300  '
400  'END OF PREPARATION ROUTINE   NOW SAVE OR LOAD AS REQUIRED.
500  '
600  'CSAVEM"FILESPEC",ST,EN,350
700  '
800  'CLOADM"FILESPEC"
```

Program Listing 1

```
10 '        "COCODEX" - CASSETTE INDEX                A.SENSICLE
20 '         *************************                 DEC 1981
100 MX=13 'MAX RECORDS -1
110 POKE 500,MX
120 CLEAR MX*28+100
130 MX=PEEK(500)
140 P=0:ST=0:EN=0 '   PREDEFINE  POINTER  AND ADDRESS VARIABLES
150 DIM NX$(MX)
160 FOR X=0 TO MX 'FILL ARRAY
170 NX$(X)=STRING$(27,46):NEXT
180 P=VARPTR(NX$(MX)) 'GET POINTER
190 ST=PEEK(P+2)*256+PEEK(P+3) '   GET START ADDRESS OF ARRAY
200 EN=PEEK(39)*256+PEEK(40) '   GET END ADDRESS OF ARRAY
210 CLS: PRINT@232,"LOADING INDEX";
220 CLOADM"INDAT"
230 CLS:FOR X=0 TO MX
240 PRINT STR$(X+1);TAB(4);NX$(X)
260 IF(X+1)/14-INT((X+1)/14)=0 THEN A$=INKEY$:IFA$=""THEN260I EL
SE IF ASC(A$)=9THEN280ELSEIFX<MX THEN CLS
270 NEXT
280 INPUT"  ENTER LINE NO. ";X
290 IFX=0 THEN 340
300 F=1 'SET SAVE FLAG GET NEW LINE
310 PRINTTAB(3);">";:LINE INPUT NX$
320 MID$(NX$(X-1),1)=NX$ 'SUBSTITUE NEW FOR OLD
330 CLS: GOTO 230
340 IFF=0 THEN 430
350 CLS: PRINT"  REWIND TAPE AND PUT CASSETTE"
360 PRINTTAB(10);"ON RECORD."
370 PRINT"   PRESS ANY KEY TO CONTINUE";
380 A$=INKEY$:IFA$=""THEN380
390 CLS:PRINT@232,"SAVING PROGRAM";
400 CSAVE"COCODEX"
410 PRINT@232,"SAVING INDEX   ";
420 CSAVEM"INDAT",ST,EN,350
430 CLS
```

Program Listing 2

You could spend hours typing in your programs,

Or you could get

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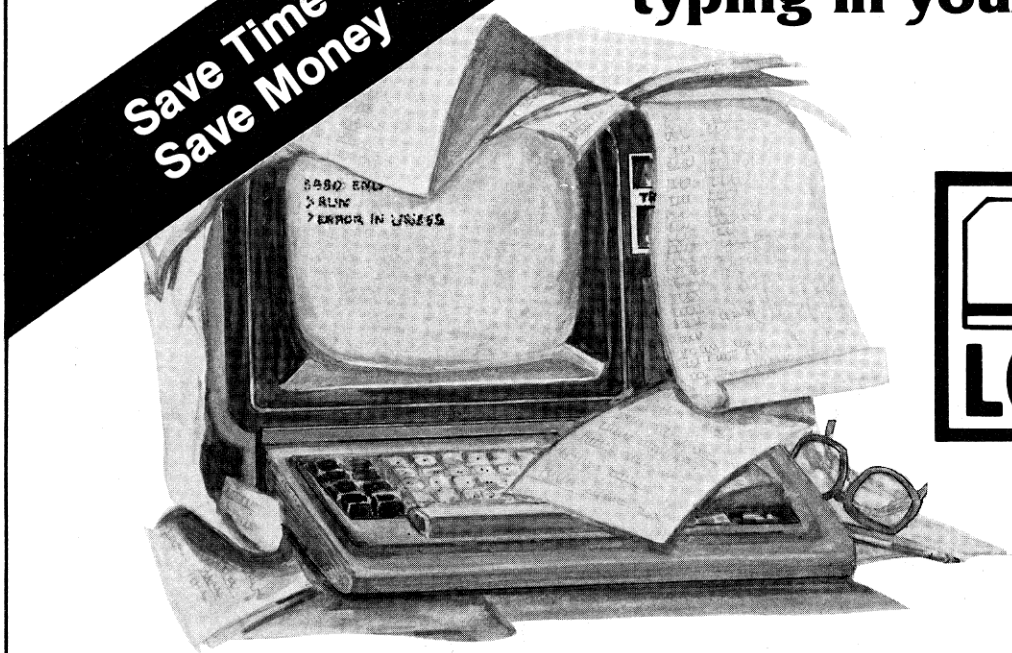

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For information about Color Load 80 see page 361.

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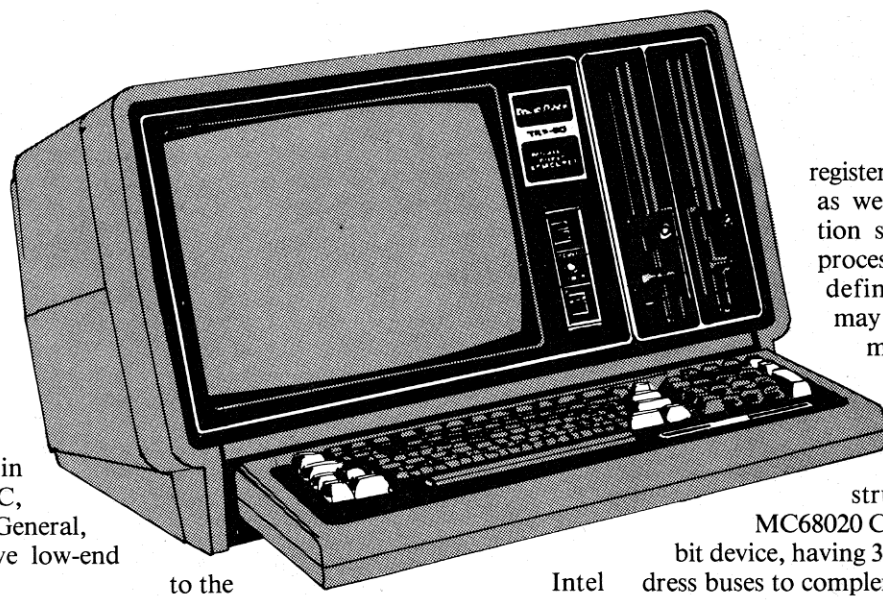
The Model 16

by Jim Hawkes



Radio Shack's 16-bit entry, the Model 16, is a significant computer design. Although the labels micro, mini, and mainframe overlap in today's marketplace, it is safe to say the Model 16 is a minicomputer. The machine has the potential to place the company squarely in competition with IBM, DEC, Burroughs, Wang, Data General, and others in the lucrative low-end minicomputer market.

Radio Shack has approached this market slowly, incorporating more intelligent (or programmable) microprocessors in their designs. Radio Shack's first computer, the Model I, contained only two programmable devices, the disk controller and the CPU. The Model II added keyboard, video, and other I/O controllers. The latest design, the Model 16, incorporates what many consider to be the most powerful of the 16-bit microprocessors, the Motorola MC68000.

It appears that Radio Shack's selection of the MC68000 may be as fortuitous as their selection of the Z80 for the Model I. The parallels of the CPU design decisions between the Model I and Model 16 is striking. When the Model I was in the design stages, the Z80 was just beginning to enter full production. Though there was very little software compared to its cousin the Intel 8080, the Z80 was thought to be a substantial improvement.

The same can be said with respect to the Intel 8086 family of 16-bit CPUs and the MC68000. The 8086 was released much earlier than the MC68000 and therefore had a substantial lead in software development. However, the Motorola microprocessor is thought to be superior—although it has very little software support.

Motorola was later than its principal competitors, Zilog and Intel, in entering the 16-bit market. By waiting, they were able to complete a design that contains over 68,000 transistors as compared to 29,000 in Intel's 8086.

Radio Shack refers to the MC68000 in the Model 16 as "advanced 16/32 bit technology." What defines a 16-bit machine remains a moot point. A simplistic view would label any processor that simultaneously reads or writes 16 bits to memory as a 16-bit processor; using this definition the MC68000 (68K) qualifies.

A more careful definition considers register widths and types as well as the instruction set of the microprocessor. Using this definition, the 68K may qualify as a 32-bit machine, since it contains 16 32-bit registers as well as a powerful instruction set. The MC68020 CPU is the true 32-bit device, having 32-bit data and address buses to complement its 32-bit internal registers.

In addition to processing four times as many bytes as 8-bit devices, the 68K prefetches instructions to the CPU before they need to be executed. When the CPU is ready to perform the next instruction, it is fetched from memory (called a cache) contained within the microprocessor. This type of look-ahead processing is called pipelining and results in faster operation since instruction fetch cycles do not interrupt instruction execution.

Another characteristic that distinguishes the microprocessor is a significantly broader range of instructions than its 8-bit counterparts. In particular, it performs hardware multiply and divide, tasks that require subroutines on most 8-bit CPUs. In addition, several instructions have been added to ease the manipulation of data structures.

Not only does the 68K operate on more bits with more instructions, it also

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operates with more speed. The 68K, as it is implemented on the Model 16, operates at 6 megahertz compared to the 4-megahertz operation of the Z80 in the Model II and 16. These higher clock speeds translate into the execution of more instructions per second. The exact number of instructions executed at a time depends upon the application, since some instructions execute more rapidly than others. However, as many as 1.5 million instructions per second can be executed at the current clock setting on the Model 16.

Anyone following hardware developments will notice that the 68K runs faster in other manufacturers' products. In fact, you might feel slightly swindled by the slower performance from the CPU. To be fair, however, some consideration must be given to the time frame of the Model 16's design and the supporting ICs built into it. After all, one and a half million instructions per second is quite significant. (Incidentally, the 68K has been run under special conditions at speeds over 16 megahertz.)

Although speed and word size are important characteristics, perhaps the most important feature is the magnitude of addressable memory area. The MC68000 is capable of addressing 16 megabytes (million bytes) of memory. Since Radio Shack did not implement all the address lines, only 524,288 bytes (512K) are available. For most users this should be sufficient, particularly considering the fact that many large multiuser systems have operated on substantially less memory.

"As many as 1.5 million instructions per second can be executed at the current clock setting on the Model 16."

Two Systems in One

Essentially, the Model 16 is two computer systems in one. The 68K is augmented with a Z80A, the same microprocessor used by the Model II as the CPU. By designing the system so that the Z80 could be used as a stand-alone CPU, the Model 16 can duplicate the functions of a Model II. When not being used in the Model II mode, the Z80 serves as a slave processor to the 68K, relieving the 16-bit CPU from time-consuming I/O tasks.

The use of the Z80 in this manner is very important in the initial success of the Model 16, since it permits the use of existing Radio Shack software. This software makes the machine useful while 68K software support is being developed. Without the Z80, the Model 16 would not currently be a marketable product, since there is very little software available that uses the 68K.

External Storage

The disk storage system is substantially different in capacity, physical size, and operation than the Model II. The first thing you will notice is that the disks are inserted in a completely different manner than in the Model II—namely, upside down. The second noticeable operational aspect is the reduction in system noise.

One of the most unattractive features of the Model II is the incessant noise produced by the constant whine of the

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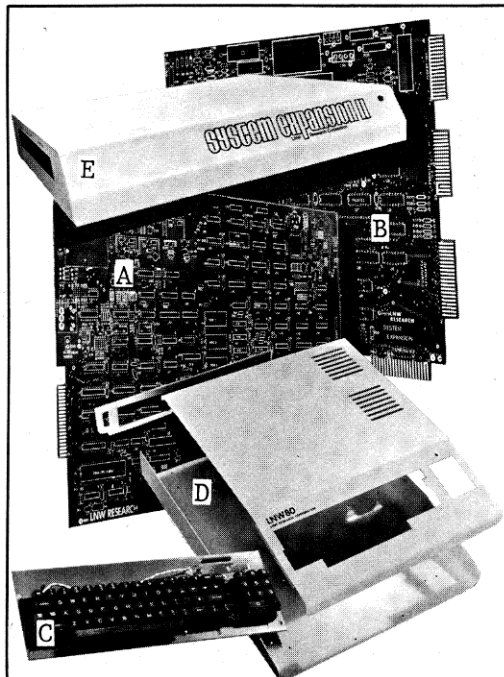

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disk drives and cooling fan. If a Model II is installed in a very quiet location, the noise it creates is frequently more than unpleasant. The Model 16 has solved this problem. Once a drive has been activated it remains rotating for only 30 seconds; if there have been no I/O operations to the drives during this period, then they are turned off. The cooling fan, however, still remains a burden to the eardrum and connecting neural passages. Surely there must have been a quieter fan or better mounting method.

The floppy-disk drives used in the system are thinline double-sided, double-density, permitting approximately 1.25 million bytes of storage per drive. Since the drives are physically much smaller than the Model II units, two can be placed in the same space as the single drive, enabling 2.5 million bytes of storage in the confines of the Model 16 enclosure. Two additional floppy drives can be added, supplying a total capacity of approximately 5 megabytes.

The Model 16 also accepts the Radio Shack hard disk, which provides almost 9 million bytes of storage capacity per drive. Up to four drives can be added providing a total of 33 million bytes of hard-disk storage.

"The lack of sufficient serial I/O ports is the most serious design flaw in the Model 16."

I/O Ports

The lack of sufficient serial I/O ports is the most serious design flaw in the Model 16. The input/ouput devices are exactly the same as the Model II. Namely, two RS-232 serial ports and one parallel port—woefully inadequate for a system designed as a multi-user system. With only two serial ports the system loses one third of its usefulness if a serial printer is utilized, and with two serial devices attached (such as a printer and a plotter), there is no room for terminals. (Radio Shack markets separately an RS-232C selector switch that lets you connect three peripherals to a single serial output port. Also, the DT-1 data terminals designed to work with the Model 16 in a multi-user configuration have their own serial and parallel printer ports.)

Internal Expansion

The Model 16 has space for only two additional cards on the system bus. This limits the number of options available to the user. For example, expanding to 1/2 megabyte of internal memory and adding a hard-disk controller would completely fill the system bus. This means the hi-resolution graphics board or ARCNET could not be installed when or if it becomes available. (Incidentally, ARCNET was not mentioned in the new September catalog.) (Radio Shack Computer Centers are claiming that ARCNET will be available "around the first of the year." This contrasts with Radio Shack's original release date of "second quarter of '82.")

Other Features

The Model 16 possesses two features that must have been the byproduct of good market research. No longer will

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interior decorators be subjected to battleship gray. The system is packaged in an attractive off-white enclosure that is identical in dimensions to the Mod II. In addition, a green-phosphor screen has replaced the old black-and-white CRT. The keyboard is detachable and in all respects seems identical to the Model II.

Current Operating System

The 16-bit operating system provided with the computer is similar in command structure to the Model II's TRSDOS. However, there are two library commands that are not discussed in the documentation. These commands, Assign and Release, appear to reflect Radio Shack's intent to provide multi-user capability. However, according to knowledgeable sources, Radio Shack's plan to develop their own proprietary operating system has been temporarily abandoned. Instead, they have purchased a multi-user, multi-tasking operating system that is a descendant of a well-known operating system, UNIX. The proposed operating system is called MTOS.

Proposed Operating System

There is nothing more useless than a computer without software. Since the Model 16 is capable of running Model II software, it is not useless. However, its "raison d'etre" was not to serve as a Model II; after all, Model II two-drive systems are more than $1,000 less than a comparable Model 16. Radio Shack advertises the Model 16 system as a multi-user system with a small caveat in the September catalog, "available first quarter 1983." Undoubtedly, it is the multi-user features of the 68K that attract buyers.

If the information from Fort Worth is accurate, the multi-user operating system scheduled for release will be vastly more sophisticated than anything heretofore offered by Radio Shack. The proposed release might be called MTOS, Multiple Terminal Operating System, and is designed as a UNIX look-alike. UNIX is the highly acclaimed operating system designed at Bell Labs primarily for minicomputers. Although UNIX has been used predominantly in the academic community, it has been forecasted by many as the dominant operating system of the 16-bit generation of micro/mini computers. However, MTOS will not contain the full set of UNIX utilities and initially will probably not contain any language, except possibly Cobol. One of the best features of MTOS is the proposed cost: free, to all Model 16 owners.

Probably one of the foremost considerations in not initially providing a complete UNIX system is the necessity of royalty payments to Bell Telephone. However, sometime during the first quarter of 1983 a full UNIX development system complete with utilities will be offered, but it will not be free. This system has been licensed from Bell and will be fully supported. Because UNIX is written in C, it would seem reasonable that any development system must incorporate this language. Fortran and Basic will likely be released in the second quarter of 1983.

Supporting an operating system such as UNIX represents a radical departure from previous marketing philosophies, since Radio Shack has never supported any operating system but their own proprietary systems. Whatever their reasons are for making the change, it is a welcome one. By providing UNIX they offer a good, well-known, and respected operating system that cannot be easily dismissed by competitors. After all, Radio Shack is entering a very competitive environment, pitting itself against well-known manufacturers such as IBM.

"Radio Shack's plan to develop their own proprietary operating system has been temporarily abandoned."

MTOS

MTOS, as currently proposed, is a virtual-memory operating system. Conceptually, virtual memory allows application programs an almost limitless amount of memory, even larger than the total amount of internal memory in the system. Virtual-memory systems have been prevalent in mainframes and large minicomputers for at least a decade. However, this type of architecture has not filtered down into the micro world primarily because of programming complexity, marketability, and performance considerations. Virtual memory systems require substantial CPU overhead; some have estimated approximately 25 percent.

(Motorola's MC68010 CPU, along with the MC68451 Memory Management unit, is designed to process virtual memory without adding processor overhead. Radio Shack has given no indication that it plans to use these parts in the Model 16.—Eds.)

In the 8-bit world, serving two or more users in addition to giving up 25 percent of CPU time to an operating system was just too much to ask, especially with only 64K of memory. Although 8-bit speeds have increased and integrated-circuit technologies have produced larger and less expensive memories, most software developers did not believe there was a real market for extremely sophisticated multi-user systems, particularly since the 16-bit processors were right around the corner.

Paging systems are the most prevalent type of virtual memory system. In a virtual system a program is divided into segments called pages, which are usually stored on disk. When the program is initiated only a portion of the pages necessary to begin execution can be loaded into memory. However, at some point during execution a page that is not in memory will be required. The absence of a necessary page is called a page fault.

When a page fault occurs, program execution must cease, and the missing page must be copied into main memory from disk. If memory is completely used there may not be a place to put this page. Thus, the operating system must decide which page to remove. Pages are continuously swapped in and out of memory until program execution is complete.

Virtual-memory environments usually provide dynamic memory allocation. In a dynamic environment a user's program is not assigned to a fixed amount of internal memory. As memory becomes available, the system distributes it among the various users according to a priority system. Suppose, for example, a system is operating with three users. If one of the users terminates, then the two remaining users would have additional memory allocated and their programs would execute more efficiently since there would be fewer page faults.

Thinking about the virtual environment will lead to a quick conclusion. There is an enormous amount of I/O to disk. This problem in the Model 16 is addressed by both hardware and software. The hardware component consists of the Z80A, which can act as a slave I/O processor for the 68K. When

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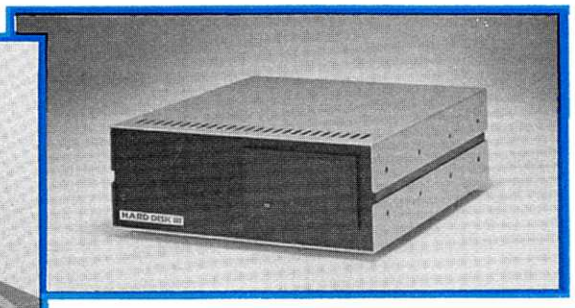

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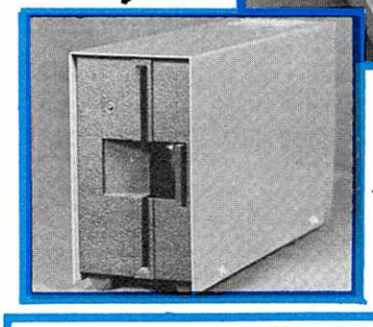

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"The Model 16 should be another Radio Shack success."

a user writes to disk, the 68K gives most of the problem to the Z80. In addition, the operating system contains a system module called the dispatcher, which determines the priority of program execution as characteristics of I/O boundedness change. For example, if a user program begins accessing a disk file, that user will not be serviced by the CPU for the same duration as other users not performing I/O tasks. However, once I/O is completed, normal CPU multi-tasking is restored.

In any kind of virtual system the memory demand can become too high and servicing page faults one after another can completely consume CPU operations. This phenomenon is called thrashing and is probably why Radio Shack suggests implementing the system with a minimum of 256K of memory and a hard disk. Floppy disks are extremely slow when compared to hard disks, and it is a difficult (if not impossible) task to implement a useful virtual-memory system in the floppy environment.

Other Operating Systems

CP/M, originally developed by Digital Research and subsequently adapted to many microcomputers, is currently available from at least two sources for the Model II operating mode of the Model 16. This operating system's vast software library can be used immediately. A 16-bit version of CP/M is being developed by at least one well-known company. In addition, MP/M, the multi-user version of CP/M, will undoubtedly become available sometime within the next 12 months. Although CP/M may be the oldest operating system for microcomputers, it is certainly not the only one.

Phase One Systems has offered, for some time, a multi-user system for the Model II as well as many other microbased systems. Oasis-16 is their new multi-user system, which is compatible with their other system software. Thus, a program written in their Basic should run without modification under Oasis-16. The current multi-user Oasis should operate in the Model II mode of the Model 16, except for patches to the disk I/O routines. However, I have not heard an official announcement nor seen a demonstration of this capability. Phase One is a dynamic and growing company that will eventually provide a good alternative operating system for Radio Shack's newest computer.

Xenix, Microsoft's version of UNIX, will eventually be adapted. (See *80 Micro*, September 1982, p. 300.)

Model II Operating Mode

About the only distinguishing characteristic of the Model 16's mimicry of the Model II is the ability to use its double-sided drives to function as a two- or four-drive Model II.

Data and programs can be transferred to the Model 16 by inserting any Model II disk and applying a series of patches contained in a DO file called Thinline. These patches compensate for the different types of disk drives used in the two systems. Occasionally, you may need to move data and programs back to a Model II. In this case, execute the complementary DO file Unthin. The system is now patched to restore Model II compatibility. It takes about two minutes to execute either DO file.

Application Software

Radio Shack has released a 16-bit version of their Cobol compiler. Since this compiler is nearly identical to the corresponding compiler released for the Model II, a large number of programs should become available relatively soon. Since the new Cobol compiler generates object code for the 68K, the additional computing power of the 16 will substantially enhance program speed, especially if the program is not I/O intensive.

Radio Shack has recompiled a number of Cobol software packages including General Ledger, Accounts Receivable, and Accounts Payable. In addition, Order Entry and Sales Analysis are available. Also, all programs advertised by Radio Shack for the Model II can be executed on the new machine.

Conclusion

The Model 16 is a powerful, competitively priced computer. It appears to have a high-quality operating system nearly ready to be released, and software support will undoubtedly be forthcoming.

The machine will satisfy the needs of many small-business users, particularly in the areas of accounting, word processing, and financial planning. The Model 16 should be another Radio Shack success. ■

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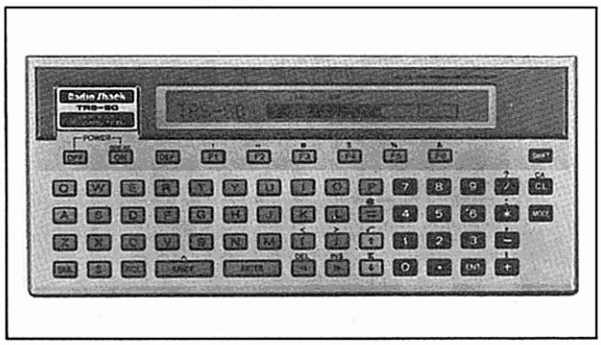

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Horse Race II

by Danley Christensen

With this revision of the original Horse Race math program, you can tailor the game to meet the individual needs of your students.

In the September 1981 issue of *80 Micro*, Michael J. Duffin's article entitled "Math Derby" included a program called Horse Race. Horse Race is an educational math game in which each player has a horse on the screen, and the horse moves when the player answers a math question correctly.

Horse Race is ideal for situations in which the players have relatively equal math skills. Each player selects the type of problem he will answer on each turn and, based on the type selected, a correct answer advances that player's horse a predetermined distance. A correct answer to an addition or subtraction question advances the horse one position; a correct answer to a multiplication question advances it two positions; and a correct answer to a division question advances it four.

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I revised the program so players of differing skill levels could compete against each other—a first or second grader could compete against a fourth or fifth grader. This can be done by having the teacher select the type of problem for each player before the game begins, using the following problem codes:

A—Addition
S—Subtraction
AS—Addition or Subtraction
M—Multiplication
D—Division
MD—Multiplication or Division

Mr. Duffin developed an ingenious way of "timing-out" a player if the player takes too long to answer a question. This involves using the INKEY$ function to accept the keys hit, and then looking at the value of all those keys strung together. The only disadvantage is that the time limit is hard-coded into the program.

I changed this time interval variable so the teacher can further control the competition. Students with different skill levels can compete using the same type of problem but with different time allowances. I altered the time interval by making the top end of the timer/answer acceptance loop changeable so the teacher can enter the top value for each student before the race begins.

Another change involved the problems themselves. I wanted all the numbers to be randomly chosen. Using random numbers in addition and multiplication gives simple, straightforward answers. However, using random numbers in subtraction is more difficult because a negative answer can result, and using random numbers in division is the most difficult, because an answer can contain decimals. I rewrote the program so the answers to the subtraction and division problems would always be positive, whole numbers.

To guarantee this result, the program performs the opposite operation on the random numbers and uses that answer in the problem for the player. For example, suppose the player selects division and the computer randomly selects the numbers 7 and 9. Neither 9 divided by 7 nor 7 divided by 9 result in a positive whole number. So, the program performs the opposite operation (7×9) and puts that answer into the problem shown to the student: 63 divided by 7 = ?. In subtraction, the random numbers 7 and 9 would produce the

A$(10,3)—Y or N flag indicating whether or not each fact (0–9) should be used for each student.

B$(5)—Holds each digit of an answer.

C(3)—Number of correct answers for each player.

D—Player's answer.

DT(3)—Delay timer.

I—Loop index and variable subscript.

J—Loop index and variable subscript.

K—Loop index and variable subscript.

K$—Last key hit by current player.

L—Loop index and variable subscript.

N$(3)—Name of each player.

NP—Number of players.

P(3)—Current print position of each horse.

Q—Variable used in intermediate calculations to alter problems so that subtraction and division answers are one digit.

R—Random number (1 or 2) used to determine which type of problem to do in Multiplication/Division and Addition/Subtraction selections.

W(3)—Number of wrong answers for each player.

W$(3)—Which problem code was selected for each player.

X—First random math fact.

Y—Second random math fact.

YS—Counter used to ensure that at least one math fact is selected for use for each student.

Z—Answer to problem.

Table 1. List of variables I used in Horse Race II. Be sure to alter array sizes, if necessary, when customizing the program.

problem 16 − 7 = ?.

I wanted the teacher to control which numbers are used in the problems so he or she can exercise a student in the student's weak areas (e.g., the multiplication table for a specific number, such as 3 or 6). I set up a two-dimensional array into which a Y or N is stored for each math fact for each student. As the second random number is generated, this array is checked to see if the number generated is desired.

Only the second fact is checked, because if you want the table for 2, the problem 2 × 9 is valid so only one random number must qualify. If you selected the multiplication table for 2 and then checked both numbers, 2 × 2 is the only problem that would ever appear.

This revised game has been used successfully at the school where my wife works. ■

Danley Christensen is a data processing analyst and computer programmer. He can be reached at 17 Walnut Hills, Springfield, IL 62707.

Program Listing

```
1000 REM*********************************************************
****************
1010 REM*                          HORSE RACE II
              *
1020 REM*                DANLEY E. CHRISTENSEN - OCTOBER 1981
              *
1030 REM*          BASED HEAVILY ON    "HORSE RACE (MATH GAME) WR
ITTEN         *
1040 REM*        BY MICHAEL DUFFIN, AND PUBLISHED IN 80-MICROCOMP
UTING,        *
1050 REM*                    SEPTEMBER 1981, PAGES 244-248.
              *
1060 REM*********************************************************
****************
1070 CLS: DIM A$(10,3)
1080 P(1)=328 : P(2)=520 : P(3)=712
1090 FOR I = 1 TO 3
1100    W$(I) = ""
1110    C(I) = 0
1120    R(I) = 0
1130 NEXT I
1140 GOSUB 2530
1150 REM*********************************************************
****************
1160 REM*                          SET PLAYING FIELD
              *
1170 REM*********************************************************
****************
1180 FOR I = 15555 TO 16195 STEP 64
1190    POKE I,191
1200 NEXT I
1210 FOR I = 832 TO 895
1220    PRINT@ I, CHR$(141);
1230 NEXT I
1240 FOR I = 192 TO 255
1250    PRINT@ I, CHR$(156);
1260 NEXT I
1270 FOR I = 15675 TO 16191 STEP 64
1280    POKE I,191
1290 NEXT I
1300 PRINT@ 896, "START"
1310 PRINT@ 951, "FINISH"
1320 FOR I = 1 TO NP
1330    GOSUB 2070
1340 NEXT I
1350 PRINT@ 0, "PRESS ANY KEY WHEN YOU ARE READY FOR
THE FIRST P
ROBLEM."
1360 K$ = INKEY$: IF K$ = "" THEN GOTO 1360
1370 REM*********************************************************
****************
1380 REM*                        EACH PLAYER'S TURN LOOP
              *
1390 REM*********************************************************
****************
1400 FOR I = 1 TO NP
1410    X=RND(10)
1420    IF X = 10 THEN X = 0
1430    Y=RND(10)
1440    IF Y = 10 THEN Y = 0
1450    IF A$(Y,I) = "N" THEN GOTO 1430
1460    PRINT@ 0,"
                  "
1470    FOR J = 1 TO 6
```

Listing continues

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```
1480        B$(J) = ""
1490     NEXT J
1500     IF W$(I) = "S" THEN GOTO 1610
1510     IF W$(I) = "M" THEN GOTO 1730
1526     IF W$(I) = "D" THEN GOTO 1650
1530     IF W$(I) = "A" THEN GOTO 1760
1540     IF W$(I) = "MD" THEN GOTO 1580
1550     R = RND(2)
1560     IF R = 1 THEN GOTO 1610
1570     GOTO 1760
1580     R = RND(2)
1590     IF R = 1 THEN GOTO 1730
1600     GOTO 1650
1610     Q = X + Y
1620     PRINT@ 0, Q"-"Y "="
1630     Z = Q - Y
1640     GOTO 1780
1650     X = RND(9)
1660     Y = RND(9)
1670     IF A$(Y,I) = "N" THEN GOTO 1660
1680     Q = X * Y
1690     Z = Q / X
1700     PRINT@ 0, Q"/"X "="
1710     Z = Q / X
1720     GOTO 1780
1730     PRINT@ 0, X"X"Y "="
1740     Z = X * Y
1750     GOTO 1780
1760     PRINT@ 0, X"+"Y "="
1770     Z=X+Y
1780     PRINT@ 64, "WHAT IS YOUR ANSWER, ";N$(I);"?"
1790     A$ = INKEY$
1800     J = 1
1810     FOR K = 1 TO DT(I)
1820        B$(J) = INKEY$
1830        IF B$(J) = "" THEN GOTO 1850
1840        J=J+1
1850        FOR L = 1 TO 10
1860        NEXT L
1870     NEXT K
1880     D = VAL(B$(1)+B$(2)+B$(3)+B$(4)+B$(5))
1890     IF Z=D THEN GOTO 1960
1900     W(I) = W(I) + 1
1910     PRINT@ 0, D" IS THE WRONG ANSWER, ";N$(V);"."
1920     PRINT@ 64, "THE CORRECT ANSWER IS ";Z;"."
1930     FOR J = 1 TO 550
1940     NEXT J
1950     GOTO 2020
1960     PRINT@ 0, Z" IS THE CORRECT ANSWER - THAT IS VERY GOOD,
";N$(I);"!"
1970     C(I) = C(I) + 1
1980     PRINT
1990     FOR J = 1 TO 550: NEXT J
2000     GOSUB 2070
2010     GOSUB 2070
2020 NEXT I
2030 GOTO 1400
2040 REM*********************************************************
***************
2050 REM*                                MOVE HORSE
            *
2060 REM*********************************************************
***************
2070 PRINT@ P(I),CHR$(32);
2080 PRINT@ P(I)+1,CHR$(32);
2090 PRINT@ P(I)+2,CHR$(32);
2100 PRINT@ P(I)+60,CHR$(32);
2110 PRINT@ P(I)+61,CHR$(32);
2120 PRINT@ P(I)+62,CHR$(32);
2130 PRINT@ P(I)+63,CHR$(32);
2140 PRINT@ P(I)+64,CHR$(32);
2150 P(I)=P(I)+1
2160 PRINT@ P(I),CHR$(170);
2170 PRINT@ P(I)+1,CHR$(140);
2180 PRINT@ P(I)+2,CHR$(132);
2190 PRINT@ P(I)+60,CHR$(160);
2200 PRINT@ P(I)+61,CHR$(134);
2210 PRINT@ P(I)+62,CHR$(151);
2220 PRINT@ P(I)+63,CHR$(131);
2230 PRINT@ P(I)+64,CHR$(171);
2240 IF P(1)>376 OR P(2)>568 OR P(3)>760 THEN GOTO 2290
2250 RETURN
2260 REM*********************************************************
***************
2270 REM*                                END OF GAME
            *
```

Listing continues

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Listing continued

```
2280 REM*****************************************************
***************
2290 FOR J = 1 TO 200
2300 NEXT J
2310 CLS
2320 PRINT@ 25,N$(I) " WINS "
2330 PRINT : PRINT : PRINT "nAME","RIGHT","WRONG","% RIGHT":PRIN
T
2340 FOR I = 1 TO B
2350    Q = C(I) * 100 / (C(I) + R(I))
2360    PRINT N$(I),C(I),R(I),Q
2370    PRINT
2380 NEXT I
2390 END
2400 REM*****************************************************
***************
2410 REM*                          ENTERING GAME PARAMETERS
            *
2420 REM*****************************************************
****************
2430 PRINT: PRINT "BESIDE EACH NUMBER BELOW, ANSWER 'Y' OR 'N' F
OR WHETHER OR NOT"
2440 PRINT "YOU WANT THAT FACT USED."
2450 FOR Y = 0 TO 9
2460    PRINT Y;: INPUT A$(Y)
2470    IF A$(Y) = "Y" THEN 2500
2480    IF A$(Y) = "N" THEN 2510
2490    PRINT "PLEASE TRY THAT ONE AGAIN.": GOTO 2460
2500    YS = 1
2510 NEXT Y
2520 IF YS = 0 THEN PRINT: PRINT "ALL YOUR SELECTIONS FOR THIS S
TUDENT CANNOT BE 'N'.  TRY AGAIN.": GOTO 2430
2530 PRINT
2540 INPUT "HOW MANY PEOPLE ARE PLAYING (1 TO 3)";NP
2550 IF NP<1 OR NP>3 THEN GOTO 2530
2560 FOR I = 1 TO NP
2570    PRINT
2580    PRINT "WHAT IS THE NAME OF PLAYER";I;
2590    INPUT N$(I)
2600    PRINT
2610    PRINT "HOW MANY SECONDS SHOULD THE COMPUTER WAIT FOR ";N
$(I);"'S"
2620    INPUT "ANSWERS";DT(I)
2630    DT(I)=DT(I)*13
2640    PRINT
2650    PRINT "WHICH OF THE SIX PROBLEM CODES FOR ";N$(I);: INPU
T W$(I)
2660    IF W$(I) = "A" OR W$(I) = "S" OR W$(I) = "D" OR W$(I) =
"M" OR W$(I) = "MD" OR W$(I) = "AS" THEN GOTO 2710
2670    PRINT: PRINT "USE ONE OF THE FOLLOWING PROBLEM CODES:"
2680    PRINT "   'A'  - aDD": PRINT "   'S'  - SUBTRACT": PRINT
"   'AS' - ADD AND SUBTRACT"
2690    PRINT "   'M'  - MULTIPLY": PRINT "   'D'  - DIVIDE": PR
INT "   'MD' - MULTIPLY AND DIVIDE"
2700    GOTO 2650
2710    PRINT : PRINT "BESIDE EACH NUMBER BELOW, ANSWER 'Y' OR '
N' FOR WHETHER OR NOT"
2720    PRINT "YOU WANT THAT FACT USED FOR ";N$(I);"."
2730    YS = 0
2740    FOR Y = 0 TO 9
2750        PRINT Y;: INPUT A$(Y,I)
2760        IF A$(Y,I)= "Y" THEN 2790
2770        IF A$(Y,I)= "N" THEN 2800
2780        PRINT "PLEASE TRY THAT ONE AGAIN.": GOTO 2750
2790        YS = 1
2800    NEXT Y
2810    IF YS = 0 THEN PRINT:PRINT "ALL YOUR SELECTIONS FOR THIS
 STUDENT CANNOT BE 'N'.  TRY AGAIN.": GOTO 2710
2820 NEXT I
2830 CLS
2840 PRINT: PRINT "W E L C O M E   T O   T R S - 8 0   H O R S E
   R A C I N G"
2850 PRINT: PRINT: PRINT: PRINT "THE RIDERS IN TODAY'S RACE WILL
 BE:"
2860 FOR I = 1 TO NP
2870     PRINT TAB(6) N$(I)
2880 NEXT I
2890 PRINT: PRINT "GOOD LUCK TO ALL RIDERS!!"
2900 PRINT
2910 PRINT: PRINT: PRINT TAB(10) "PRESS ANY KEY WHEN READY TO ST
ART THE RACE"
2920 K$ = INKEY$
2930 IF K$ = "" THEN 2920
2940 CLS
2950 RETURN
```

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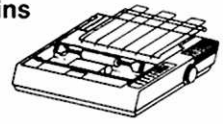

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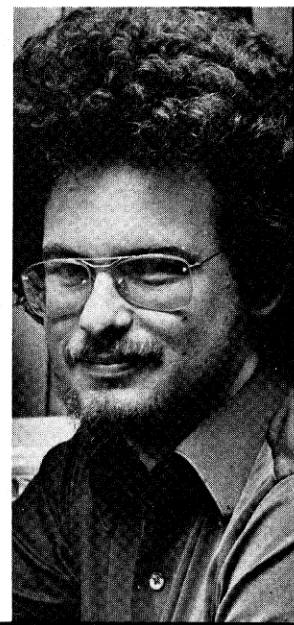

The Snappware College Educated Garbage Collector (SNAPP-VI) is an intelligent processing function which greatly improves performance of typical BASIC applications. And here's why.

Microsoft uses a 'variable length string' in the BASIC interpreter. Each time the string is assigned a new value, it is relocated in a string pool. Periodically the string pool must be reorganized and condensed into a single contiguous area. Performing this string space reclamation is time consuming and inefficient because this approach evaluates and collects each string individually. The time required is roughly proportional to the square of the number of active strings in the resident program. During reclamation the system seems to 'lock-up' and does not respond to the operator until the process is completed.

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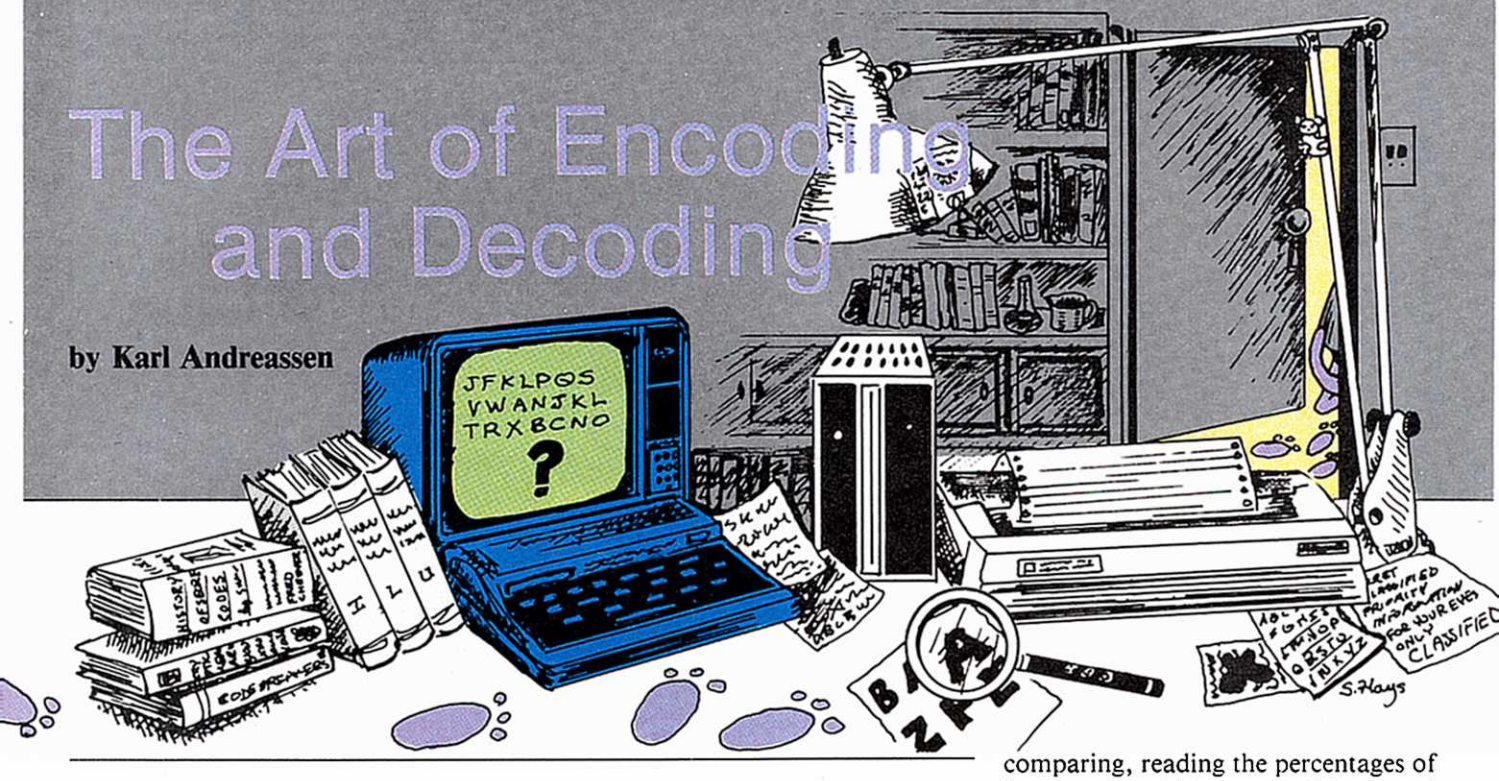
The Art of Encoding and Decoding

by Karl Andreassen



Use your computer to translate your messages into an indecipherable mess; then, with this program, you can translate them back again.

Charles Babbage, the father of the modern computer, was an extraordinary cryptologist.

Cryptanalysis was to him an extension of his interest in statistics and probability; he was the first to apply algebra to the task of deciphering encrypted messages. While all cryptologists of his day considered polyalphabetic ciphers (those using multiple keys) impossible to break, he cracked them and made it appear easy.

Using the computer to encipher and decipher plain language (plaintext) is a natural. Numerous machines have been designed to do this work over the years, most of them mechanical and electromechanical. There is considerable repetitive, trial-and-error work involved in creating a cipher and returning the cipher to readable form, so this is an ideal application for the computer. And when the truly demanding work of cryptology is involved, when the analyst attempts to discover the key to an encrypted message, the computer can relieve the tedium of searching, comparing, reading the percentages of letter and multi-letter repetitions, and apply bits and pieces of key after key to the unknown cipher.

There is more to deciphering a cryptic message than turning a machine loose on the ciphe:.ext. There are a number of approaches that sometimes pay off in short order, but more often it takes hours of challenging study and testing of possibilities before the slightest intimation of pay dirt.

The hours spent testing ciphers against possible keys can be reduced to minutes, or even to seconds, by a simple computer program.

The simplest cipher is direct substitution of letters. If you lay out a line of alphabet and put below it another line

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z —Alphabet
B C D E F G H I J K L M N O P Q R S T U V W X Y Z A —Cipher key

Table 1

ABCDEFGHIJKLMNOPQRSTUVWXYZABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ

Table 2

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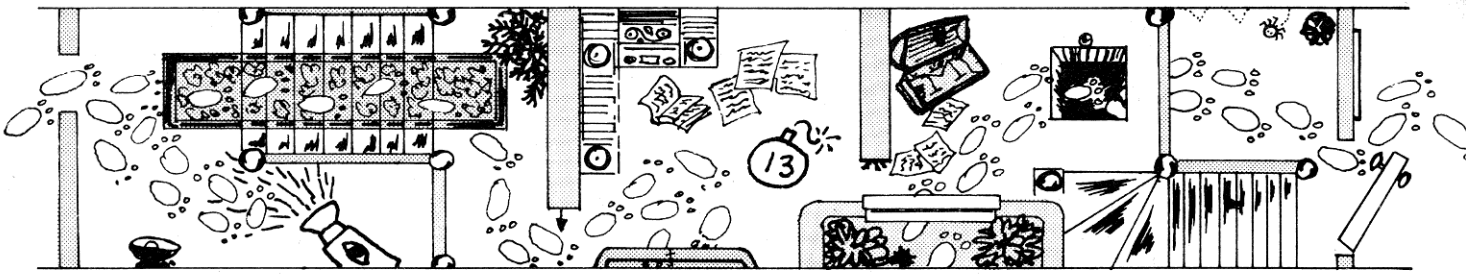


Program Listing 1

```
10 ' This program demonstrates that the
   common trigraph "the"
20 ' requires something over 17,000
   "throws" to be selected at random.
30 CLEAR 1000
40 RANDOM
50 FOR X=1 TO 20
60 FOR Y=1 TO 3
70 A$= CHR$(RND(26)+64)
80 B$=B$+A$
90 NEXT Y
100 IF B$="THE" THEN 170
110 PRINT B$" ";
120 B$=""
130 A=A+1
140 NEXT X
```

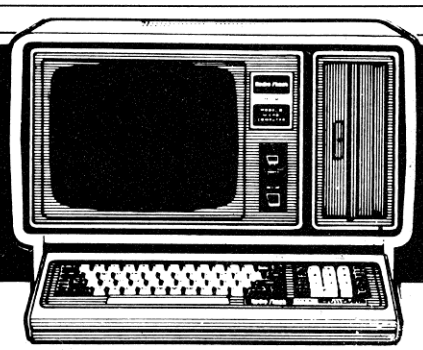
Listing 1 continues

of the same alphabet, you get a cipher key by sliding the lower line one character to the left (or right).

The key to the cipher in Table 1 is wraparound, where the end of a line continues without punctuation onto the next line.

The alphabet slides one letter to the left, and the letter hanging over the edge moves to the other end. If you lay out two alphabets in series, wraparound takes place unobtrusively (see Table 2).

Now the lower alphabet can slide left quite easily, one letter at a time. The ciphertext is created by substituting, letter for letter, the plaintext in the upper row for the letters in the second row. So, to encode the word computer, C becomes D, O becomes P, M becomes N, and so on. The ciphertext becomes "DPNQVUFS" and is no longer pronounceable.



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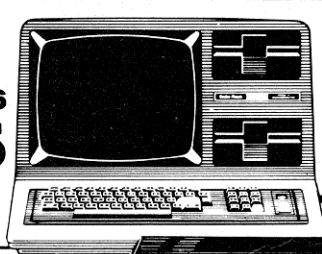

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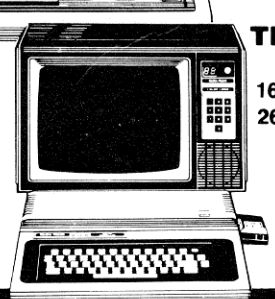

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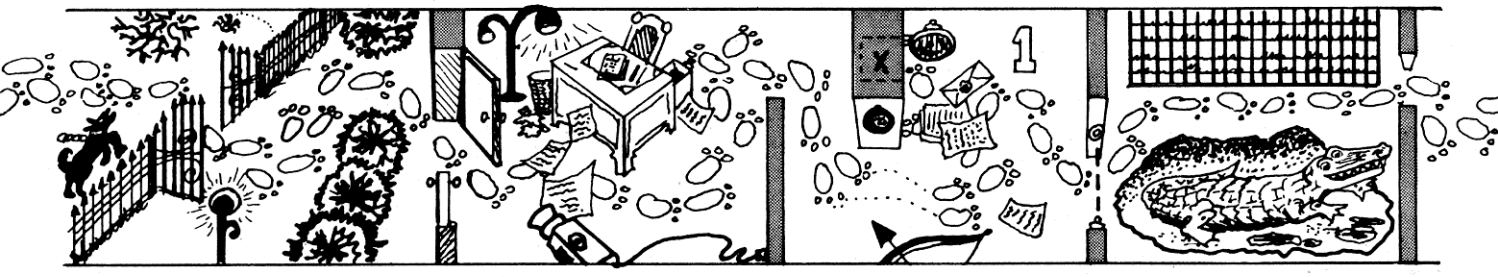

Listing 1 continued

```
150 PRINT
160 GOTO 50
170 PRINT :PRINT :PRINT "AT THE "A"th
   THROW, THE COMMON"
180 PRINT "PLAIN LANGUAGE WORD '"B$"'
   WAS CAST."
190 END
```

```
A-Z 1 / ABCDEFGHIJKLMNOPQRSTUVWXYZ
THISISAREPRESENTATIVEPRINTOUTASITAPPEARSINHARDCOPYASYOUCANSE
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RODUCETHISCOPYOFPLAINLANGUAGETYPEWHENENTEREDUNDERMENUBOPTION
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```

Fig. 1. Option B Printout

Program Listing 2

```
10 CLS :CLEAR 5000
20 DIM A$(255), B$(26)
30 PRINT :PRINT :PRINT :PRINT :PRINTTAB(20) "CRYPTANALYST'S AIDE No. ONE
40 PRINTTAB(24) "by Karl Andreassen
50 PRINTTAB(28) "July 1982
60 FOR X=1 TO 1000 :NEXT X :X=0
70 PRINT :PRINTTAB(5) "Crypto Aide No.1 affords three optional functions:"
80 PRINT :PRINTTAB(30) "< A >"
90 PRINTTAB(5) "The program generates a standard alphabet against which the
100 PRINTTAB(5) "cipher is compared 26 times, each comparison being slid one
110 PRINTTAB(5) "letter along the alphabet.  The alphabet is then reversed
120 PRINTTAB(5) "and comparison made at each of 26 positions. " :PRINT
130 PRINT :PRINTTAB(30) "< B >"
140 PRINTTAB(5) "The analyst may enter a unique  alphabet from the keyboard.
150 PRINTTAB(5) "It will be tested against the cipher input at 26 succeeding
160 PRINTTAB(5) "positions, reversed and again compared at 26 positions."
170 PRINT :PRINT :PRINTTAB(30) "< C >"
180 PRINTTAB(5) "The analyst may enter a keyword.  The program will construct
190 PRINTTAB(5) "the unduped balance of the alphabet, for 26 comparisons in
200 PRINTTAB(5)"forward and 26 in reverse order.":PRINT
210 PRINTTAB(10) "SELECT < A >," SPACE$(10)"NOTE: Program will require up to 60
220 PRINTTAB(10) "..... < B >," SPACE$(10)"seconds preparation time for each
230 PRINTTAB(10) "..... < C >," SPACE$(10)"trial, dependent upon input length.
240 PRINTTAB(10)STRING$(7,46);:INPUT A0$
250 IF A0$="A" OR A0$="a" THEN 280
260 IF A0$="B" OR A0$="b" THEN 510
270 IF A0$="C" OR A0$="c" THEN 580
280 CLS :PRINTTAB(10) "ENTER THE CIPHER UNDER STUDY EXACTLY AS RECEIVED."
290 PRINTTAB(10) "SPACE BAR OK, BUT NO PUNCTUATION PERMITTED.":PRINT
300 PRINT :PRINT "IF ENTRY COMPLETE BEFORE AUTO CLOSE, TOUCH ASTERISK."
310 PRINT :PRINT
320 X=X+1 :I=X
330 IF X>255  THEN 400
340 Z$=INKEY$ :IF Z$="" THEN 340
350 IF ASC(Z$)=32 OR ASC(Z$)=13 THEN PRINT " "; :GOTO 340
360 IF Z$="*" THEN 400
370 A$(X)=Z$
380 PRINT A$(X);
390 GOTO 320
400 CLS :PRINT "TRANSLATION PROCEEDING NORMALLY."
410 FOR X=1 TO 26
420 A$=A$+CHR$(X+64)
430 NEXT X
440 IF A0$="C" THEN 810
450 FOR Y=1 TO 2
460 FOR X=1 TO 26
470 B$=B$+CHR$(X+64)
480 NEXT X
490 NEXT Y
```

Listing 2 continues

A line of scrambled text is not easy to key into a typewriter or a computer. Experience has revealed that the keyboard operator handles scrambled text best in five-letter code groups. So virtually all ciphertext is sent and received in five-letter code groups, to obscure the word divisions, and to make the ciphertext easier to work with.

Most *80 Micro* readers can look at the two lines in Table 2 and the grey matter starts churning up a suitable Basic subroutine to produce the two lines. Then, you start wondering how to get the computer to substitute a keyed-in letter for one of the cipherkey letters. When you succeed with this, you slide the cipherkey one space after another to the left until all letters have been used, making a total of 25 different cipherkeys (besides the plaintext alphabet that produces a one-to-one key of little value).

"Virtually all ciphertext is sent and received in five-letter code groups."

At this point you can add 26 more cipherkeys by inverting either the plaintext alphabet or the cipherkey alphabet (but not both). You now have a program that will test ciphertext fragments against 51 different substitution keys. With pencil and paper it would take hours; a TRS-80 can do it in minutes.

Program Listing 1 produces a series of three consecutive letters, each randomly produced from the 26-letter alphabet. I've incorporated a word trap that stops the program when "the" is produced by chance, and screens the total number of three-letter groups formed to that point. Pure chance dictates that only once in $26 \times 26 \times 26 = 17{,}576$ tries will any given three-letter word appear. The selected word could come up the first try, or the program

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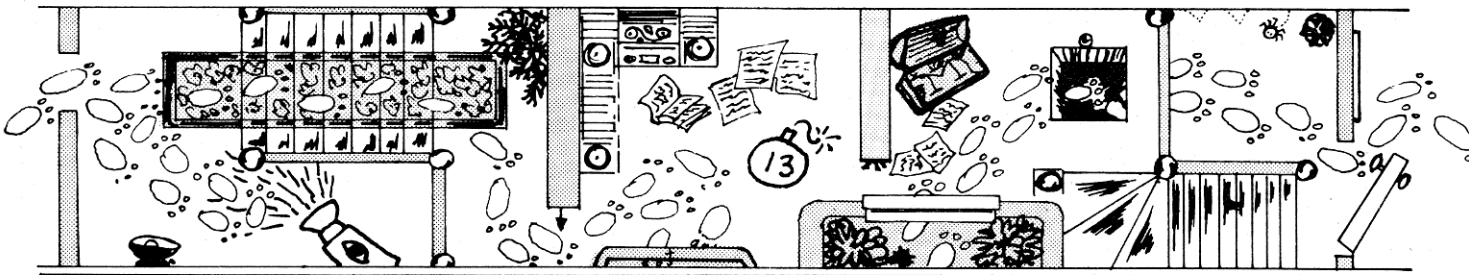

Listing 2 continued

```
500 IF A0$="A" OR A0$="B" THEN 810
510 CLS :PRINT "ENTER TEST CIPHER ALPHABET, 26 CAPITAL LETTERS,
520 PRINT "NO SPACES, NUMBERS, OR PUNCTUATION."
530 PRINT STRING$(25,46);"!"
540 LINE INPUT B$
550 B$=B$+B$
560 PRINT B$ :FOR X=1 TO 1000 :NEXT X :X=0
570 GOTO 280
580 CLS :PRINT "ENTER KEYWORD, UPPER CASE ONLY.  DO NOT USE A LETTER
590 PRINT "TWICE, AND DO NOT USE THE LETTER 'Z' : ";K1$
600 PRINTSPACE$(40);:LINEINPUT K1$
610 X=LEN(K1$)
620 FOR Y=1 TO X
630 B$(Y)=MID$(K1$,Y,1)
640 B$=B$+B$(Y)
650 NEXT Y :X=X+1:W=0 :GOTO 670
660 X=X+1
670 W=W+1
680 IF W>26 THEN 780
690 A$=CHR$(W+64)
700 B$(X)=A$ '== Assign letter to an array position
710 FOR Y=1 TO X-1 '== Prevent comparison of selection with itself.
720 IF B$(Y)=A$ THEN GOTO 670'== If any letter repeated,
730 NEXT Y '== selection is cancelled and another made.
740 B$=B$+B$(X) '== Accumulate alphabet.
750 IF X<26 THEN GOTO 660'== Cut off selection at full alphabet.
760 IF MID$(B$,26,1)="Z" THEN 780ELSE 770
770 PRINT "PROBABLE DOUBLE LETTER IN KEYWORD -- BEGIN AGAIN." :END
780 B$=B$+B$ :PRINT B$
790 FOR A9=1 TO 1000 :NEXT A9
800 IF A0$="C" THEN X=0 :GOTO 280
810 FOR Y=1 TO 26
820 Z=Y+25
830 FOR X=Y TO Z
840 C$=C$+MID$(B$,X,1)
850 NEXT X
860 GOSUB 960
870 NEXT Y
880 IF D=1 AND Y=27 THEN PRINT "BOTH SERIES UNSUCCESSFUL.  RESTART. " :END
890 D=1
900 B$="" :FOR Y=1 TO 2
910 FOR X=26 TO 1 STEP -1
920 B$=B$+CHR$(X+64)
930 NEXT X
940 NEXT Y
950 PRINT "REVERSED ALPHABET" :GOTO 810
960 FOR X1=1 TO I-1 '== I represents total cipher characters input.
970 F=ASC(A$(X1))-64
980 F$=MID$(C$,F,1)
990 G$=G$+F$
1000 NEXT X1
1010 PRINT :PRINT "IF PLAIN LANGUAGE APPEARS, EUREKA!"
1020 PRINT "CIPHER ALPHABET HAS BEEN DISCOVERED: " :PRINT
1030 IF D=0 THEN PRINT "A-Z"
1040 IF D=1 THEN PRINT "Z-A"
1050 PRINT X-26;"/ ";G$
1060 PRINT :PRINT :PRINT :PRINT ".............NEXT COMPARISON ? <Y> "
1070 PRINT ".....ANOTHER CIPHER ALPHABET ? <C>"
1080 PRINT "PROCESS SUCCESSFUL DISCOVERY ? <P>"
1090 PRINT STRING$(24,46)"QUIT ? <Q>"
1100 A1$=INKEY$ :IF A1$="" THEN 1100
1110 IF A1$= "Y" THEN C$="" :G$="" :CLS :PRINT :RETURN
1120 IF A1$= "C" THEN 10
1130 IF A1$= "P" THEN 1160
1140 IF A1$= "Q" THEN END
1150 PRINT "PROMPTS MUST BE ANSWERED AS LISTED" :GOTO 1100
1160 CLS :PRINT :PRINT :PRINT "SUCCESSFUL CIPHER ALPHABET IS:  "
1170 PRINT :IF D=0 THEN PRINT "A-Z"X-26;"/ "C$ :PRINT
1180 IF D=1 THEN PRINT "Z-A"X-26;"/ "C$ :PRINT
1190 INPUT "PRINT HARD COPY < Y/N > ";A8$
1200 IF A8$="Y" AND D=0 THEN LPRINT "A-Z"X-26;"/ "C$
1210 IF A8$="Y" AND D=1 THEN LPRINT "Z-A"X-26;"/ "C$
1220 IF A8$="N" THEN 1060
1230 INPUT "PRINT HARD COPY OF PLAINTEXT DISCOVERY < Y/N > ";A8$
1240 IF A8$="Y" THEN LPRINT G$ ELSE 1060
1250 GOTO 1060
```

might run for hours without hitting it: A quick look at any text reveals that "the" is a fairly common English word; sooner or later, pure chance will produce a three-letter word.

For the odds against a chance arrangement of letters producing four-letter words, multiply the total above 26.

A message enciphered with the ingenuity of a battery of crypto specialists carries within its framework its own key. It follows that there is no unbreakable cipher, although Stanford University recently announced a computer coding system believed to be virtually impregnable against attack by any analyst.

Thus the challenge: to create the most secure cipher possible that yet can be reasonably easy for the intended addressee to decipher. And the other side of the coin: to crack the most carefully concealed cipher for its key, and ultimately, its message.

The Challenge

The give and take of enciphering and deciphering messages can be called an intellectual "game," although in modern dress it can be a game of life or death, or of fortune played against possible incarceration. For many it can be even more exciting than the "invader from outer space" computer games.

I cannot quite call cryptanalysis a game, but even though it can be a deadly serious undertaking, it is a game to some people.

Computer data security is one of those games. The more effective the security programmer, the more likely it is that he has some kind of experience in cryptology.

An entertaining and educational book on cryptology is David Kahn's *The Codebreakers* (MacMillan, 1967). It is available in most public and university libraries and I highly recommend it.

Cryptaide One

The intent of this series is to use the computer as a ciphertext tool, as well as to create and decipher messages. This first program for reading a cipher with an unknown key explores the computer's ability to assist in solving substitution ciphers. Most ciphers are based

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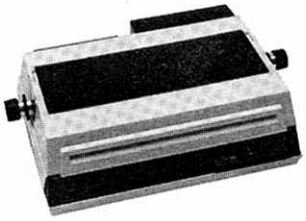

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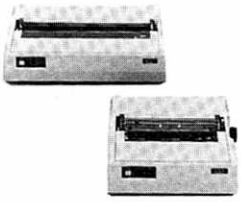

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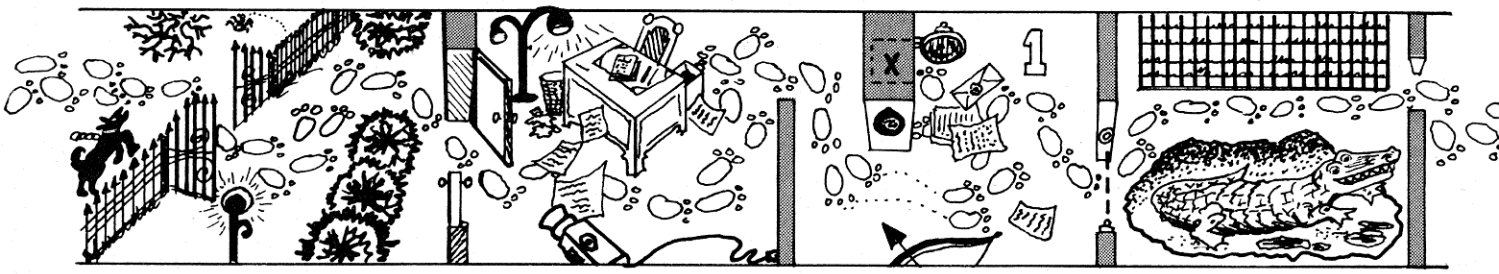

upon a variation of simple substitution, so before you begin to work on any unknown cipher, examine it for simple substitution.

There are three unknowns that must be addressed. If it uses substitution cipher, is the key one of the 51 common variations of strip cipher? Does the cipher key use a regularly interspersed version of the alphabet such as ANBOCPDQ. . . Z? Is a keyword used as the initial letters of the cipher alphabet?

Cryptanalyst's Aide 1 produces plaintext and cipher alphabets, so you can examine part of the received ciphertext against the cipherkey, when you make the A menu selection. Then slide the key one space left with each cycle until you have checked all 25 possibilities. Then invert the cipherkey alphabet and examine all 26 reverse-alphabet possibilities one by one.

The text resulting from substituting the ciphertext alphabet for the plaintext alphabet appears on screen, preceded by its serial number. Just above the serial number, either A–Z or Z–A signals the mode, straight or reverse, in which the cipherkey is operating. The resulting text appears without spaces as a solid line. When plaintext appears, it seems to leap out at you, even though at times some of the lines contain only a chance word or two that is recognizable.

The greater the bite of ciphertext that you enter into the program for translation, the more time the computer needs to prepare each of the 51 translations. If you enter a full array of 255 characters, each step takes 55 seconds; this amounts to an hour if none pan out. So only enter from 15–25 letters of the ciphertext initially.

The B menu option allows you to enter an alphabet of your own devising. This is helpful during ciphertext analysis when clues suggest a certain regular alphabet. The indicated alphabet can be entered and the result tested for generation of plaintext against one or all 51 variations of that alphabet. Further, if you discover plaintext from a selected fraction of the ciphertext in the A option, you can enter the discovered alphabet in the B option and enter up to 255 letters of ciphertext to read the message. This can save 10–50 minutes over entering the entire message in the menu A option.

A variation of the standard alphabet is the keyword option, choice C on the menu. In this variation, enter a word known to the sender and receiver of the message as the first letters of the cipher alphabet. If any letters are repeated in the word, such as the a in Alaska, omit the redundant letters. The program continues the alphabet from the word's last letter, omitting any letter used in the keyword.

"With the addition of a subroutine similar to that used in this Scripsit dictionary, you could enter the ciphertext. . . and wait for the computer to crack the cipher."

If there is an underlying message in the approach to computer-assisted cryptography, it is to use the computer as a tool, and to increase the creative human effort. Don't rely on the computer to make the critical decisions, although the computer recognizes plain language when it appears, provided the program and the time are available to incorporate this function into your operation. With the addition of a subroutine similar to that used in the Scripsit dictionary, you could enter the ciphertext into the keyboard and sit back and wait for the computer to crack the cipher. Such a program has yet to be written.

Program Construction

Following a standard menu-selection routine, enter the ciphertext into the program beginning at line 320, using the INKEY$ loop. It is easier to enter plain language or ciphertext groups as discrete words or groups using the space bar, even though the spaces aren't used. I include this feature for the operator's convenience, and spaces and carriage returns are bypassed by line 350.

When line 330 detects the 255th character, or when the operator touches the asterisk, the command proceeds to the alphabet-generating subroutines beginning at line 400. These subroutines lay the CHR$-generated letters in a string for later use.

Variations on the straight alphabet, where letters are interspersed at 1, 2, 3-or-more-space intervals, are entered at line 530 and used as the cipherkey alphabet instead of the standard alphabet.

When you enter a keyword, it is put through the routine beginning at line 650 and ending at 760 to add the missing letters in alphabetical order for a total of 26 letters. If you enter a repeated letter inadvertently in the keyword, line 770 rejects the entry and asks for a rerun. To accomplish this, the letter Z is unusable in the keyword, and if it does not appear as the 26th letter of the cipher alphabet, the rejection goes into effect. Since most keyword alphabets devised by casual cryptographers end in Z and since there is provision for entry of special keyboards through menu B, the automatic feature is a time saver.

With alphabets ready, the program translates the ciphertext into each version of test text as determined by the cipherkey for a total of 51 (52 including the original alphabet). Lines 900–940 invert the ciphertext; the resultant texts

```
QYQDS CDMGD CUYUJ CJQYQ XXMEB XMNXC NMOIB JMZYC EMCLX JMOZS
BXCKZ QEYXC PMLCW DNCOO QYICD QFFSI DEQKQ RIDMY DMUYB QBMZY
QDNPC CGYXJ MZMIY ECZMX CNMOI BJMZI DKQOZ SBXIO EMYYQ KMXJQ
DHWYX XWZDI DKQEQ OJIDM FCCYM CDXJM OIBJM ZXMTX
```

Fig. 2. Unsolved Crypto Message

are produced in subroutine 960–990.

The submenu presents four options, each showing on screen the resultant translated text. If at the 26th reverse-alphabet you decide to enter another test key word, touching C reruns the program. If the first option Y turns up plain-language text, then the option P prints out that text. The program does not restrict printer width defaults, so if you want 60-character width and no line skipping at the top of the page, type SYSTEM "FORMS P=0 L=0 W=60" and answer the three succeeding prompts. And if your eyes won't stay open any longer, Q awaits your touch. ■

Karl Andreassen (24750 Chianti Rd., Cloverdale, CA 95425) enjoys electronics and jogging.

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Soon after I purchased a Radio Shack Line Printer VII, I needed a routine to duplicate the video display on paper. Most routines available for the TRS-80 (such as the built-in shift-down-arrow * of the Model III) reproduce only alphanumerics. They usually translate graphic characters into dots.

The short subroutine shown in the Listing duplicates the video display on the Radio Shack LP VII. With the exception of special characters (codes 1–31 and 192–255 for the Model III) the screen is reproduced on paper (Fig. 1).

The LP VII supports two operating modes: character print mode (ASCII decimal 32–127) and graphic print mode. The control code decimal 18 switches from character print mode to graphic mode and control code 30 switches back to character print mode.

The program scans each line of the video display, first in the alphanumeric mode then in the graphic mode. The printing head faithfully reproduces any character and graphic patterns encountered. This routine repeats until the last line of the display is printed. Since this program is written in Basic it will take approximately 15 minutes for a complete screen printout. ■

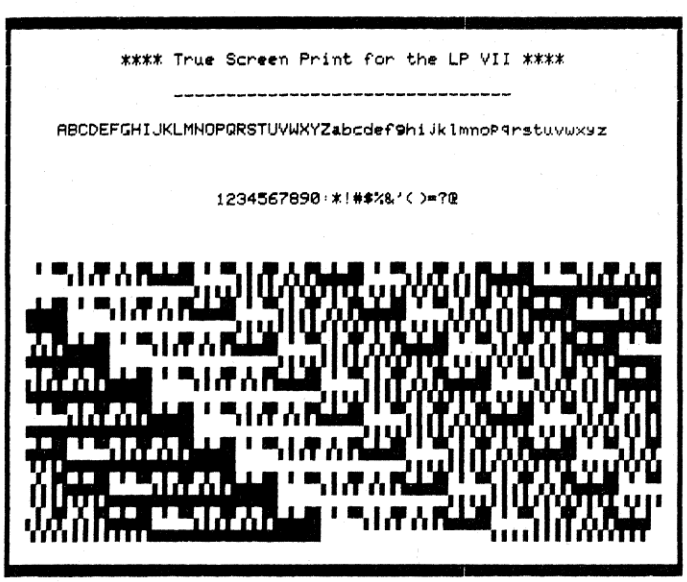

Figure 1

The Key Box

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```
10 'True Screen Print for the LP VII
20 'by Serge Y. Calmettes
30 '1306 Kensington Cresc.
40 'Belleville, Ont. Canada K8P 4T4
50 '*****************************************************
60 'The subroutine starts at line 50000
70 'The following is a short demo of this subroutine
80 CLS
85 PRINT@527,"True Screen Print for the LP VII";
90 A=0:B=127:C=0:D=47
100 FORX=ATOB:SET(X,C):NEXTX
110 FORY=CTOD:SET(B,Y):NEXTY
120 A=A+2:C=C+2
130 FORX=ATOB:SET(X,D):NEXTX
140 FORY=CTOD:SET(C,Y):NEXTY
150 B=B-2:D=D-2
160 IFB=105GOTO180
170 GOTO100
180 FORX=ATOB:SET(X,C):NEXTX
190 GOSUB50000
200 END
50000 Y=0:FORV=15360TO16383STEP64
50010 P1=0:FORI=0TO63:P=PEEK(V+I):IFP<33ORP>126THENP=0
50020 P1=P1+P:NEXTI:IFP1=0GOTO50060
50030 FORI=0TO63
50040 P=PEEK(V+I):IFP<32ORP>126THENP=32
50050 LPRINTCHR$(P);:NEXTI:LPRINTCHR$(26);
50060 LPRINTCHR$(18);
50070 FORW=1TO3
50080 P1=0:FORX=0TO127
50090 P=POINT(X,Y):P1=P1+P:NEXTX:IFP1=0GOTO50150
50100 FORX=0TO127
50110 P=POINT(X,Y):IFP=-1THENP=255:GOTO50130
50120 P=128
50130 LPRINTCHR$(P);CHR$(P);CHR$(P);
50140 NEXTX
50150 LPRINTCHR$(10);:Y=Y+1:IFY=48THENEND
50160 NEXTW
50170 LPRINTCHR$(30);
50180 NEXTV
50190 RETURN
```

Program Listing

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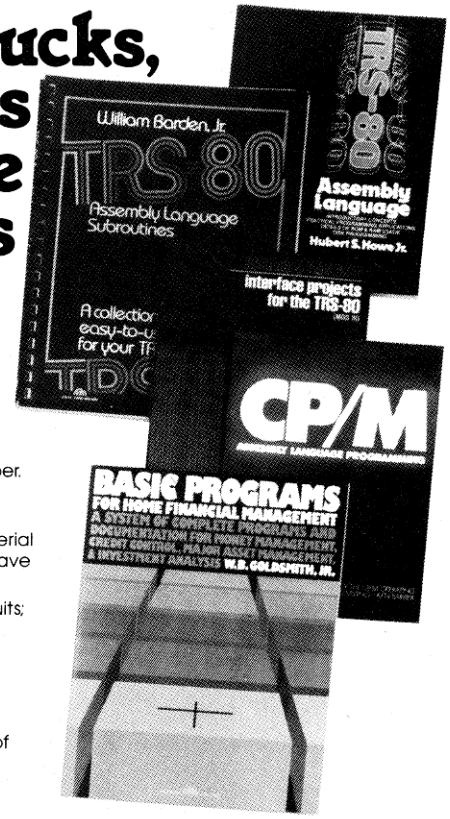

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Fun for the Younger Set

by Safi Bahcall

The Key Box

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Introduce your 5-year-old to the TRS-80 with these math and word identification programs.

Program Listing 1. Word Program

```
10 CLS
20 CLEAR 1000
25 DIM A1$(50),A2$(50)
30 RESTORE
40 FOR I=1 TO 20 : READ A1$(I),A2$(I):NEXT
50 RA=RND(20)
60 B$(1)=A1$(RA):B$(2)=A2$(RA)
70 RN=RND(4)
80 P(1)=202:P(2)=242:P(3)=778:P(4)=818
85 PRINTCHR$(23)
90 PRINT@P(RN),B$(2)
100 IFRN<>4THEN PRINT@P(4),B$(1)
110 IFRN<>3THEN PRINT@P(3),B$(1)
120 IFRN<>2THEN PRINT@P(2),B$(1)
130 IFRN<>1THEN PRINT@P(1),B$(1)
140 FOR Y=1 TO 47:SET(64,Y):NEXTY
150 FOR X=1 TO 127:SET(X,23):NEXT
160 Y$=INKEY$:IFY$="" THEN 160
165 IF Y$="s" THEN 700
180 IF Y$="Y" THEN V=1
181 IF Y$="U" THEN V=2
182 IF Y$="H" THEN V=3
183 IF Y$="J" THEN V=4
190 GOTO 500
200 ' BAD GUESS
210 FORX=62 TO 67:RESET(X,24):NEXT
220 FOR Y=24 TO 26:RESET(60,Y):RESET(61,Y):RESET(68,Y)
230 RESET(69,Y):NEXT
235 B=B+1
240 FOR I=1 TO 999:NEXT:CLS:GOTO 50
499 STOP
500 ' GOOD GUESS
510 CLS
520 T=191
530 PRINT@351,CHR$(176)+CHR$(176)+CHR$(176)
540 PRINT@413,CHR$(176)+CHR$(188)+CHR$(T)+CHR$(T)+CHR$(T)+CHR$(1
88)+CHR$(176)
550 PRINT@474,CHR$(188)+CHR$(188)+CHR$(T)+CHR$(T)+CHR$(188)+CHR$
(T)+CHR$(T)+CHR$(T)+CHR$(188)+CHR$(T)+CHR$(T)+CHR$(188)+CHR$(188
```

Listing continues

I decided that it was about time for my five-year-old sister to start playing with the TRS-80. A program written for her had to be not only interesting but fun—something she enjoyed. I remembered that she had a book of games for tots that she liked playing very much. One of the games was to try to find the different word among a group of words; for example, finding the word "boy" among 10 "joys." I put this game on the TRS-80 and made it simple enough so that my sister could use it. (See Program Listing 1.)

The Word Game

When you run the program, the screen clears and is divided into four sections, with one word in each. Three are the same and one (obviously) is different. You have a choice of pressing one of four keys: Y, U, H, J. These form a box in the center of the keyboard. For the corner on the screen that you think contains the different word, press the respective key. For example, if the odd word is in the top left corner, press the top left key, which in this case is Y. If the answer is right, a smiling face appears. If it is wrong, a sad face appears. If at any time you want a score, just press shift and S. A score will be displayed, including a percentage of correct answers.

The Math Program

I also wrote a math program (Program Listing 2) for my sister. It deals with simple addition. The game is really fun and I enjoy playing it too. My sister liked it so much that my mother had to

Listing continued

```
)
560 PRINT@538,CHR$(131)+CHR$(131)+CHR$(143)+CHR$(T)+CHR$(T)+CHR$
(T)+CHR$(T)+CHR$(T)+CHR$(T)+CHR$(T)+CHR$(143)+CHR$(131)+CHR$(131
)
570 PRINT@606,CHR$(131)+CHR$(T)+CHR$(T)+CHR$(T)+CHR$(131)
580 IF V<>RN THEN 200
590 X=57
600 FOR Y=24 TO 26
610 FOR T=1 TO 2:X=X+1:RESET(X,Y):NEXT T
620 NEXTY
630 RESET(64,26):RESET(65,26)
640 X=65:FORY=26TO24STEP-1:FORJ=1TO2:X=X+1:RESET(X,Y):NEXTJ,Y
645 G=G+1
650 FOR I=1 TO 999:NEXT:CLS:GOTO 50
700 ' SCORE
710 CLS:PRINT"THE SCORE SO FAR IS:"
720 PRINT"GOOD = "G
730 PRINT"BAD = "B
740 PRINT"TOTAL = "(B+G)
745 IF (B+G)=0 THEN 760
750 PRINT"PERCENTAGE = "INT( (G/(G+B))*100 +.5 )
760 FOR I=1 TO 2400:NEXT:CLS:GOTO 85
999 GOTO 999
1000 DATA PUP,CUP , FIT,FAT , PIG,DIG , TAR,BAR
1010 DATA TIP,TOP , SAD,MAD , RUN,FUN , PIT,POT
1020 DATA HOT,HIT , LID,LIP , TOY,BOY , BED,RED
1030 DATA MAN,MEN , BAT,MAT , DAY,PAY , MOW,ROW
1040 DATA BIT,HIT , HAT,RAT , LIP,LAP , BIG,BAG
```

```
10 CLS
15 YC=22
20 FOR Y=0 TO 5:SET(48,Y):SET(52,Y):NEXT
30 FOR Y=11 TO 23:SET(38,Y):SET(67,Y):NEXT
40 FOR X=38 TO 67:SET(X,23):NEXT
50 FOR Y=24 TO 27:SET(56,Y):SET(60,Y):NEXT
60 SET(56,28):FOR X=56 TO 67:SET(X,29):NEXT
70 FOR X=60 TO 126:SET(X,27):SET(X,29):NEXT
80 X1=RND(7):X2=RND(7)
90 PRINT@848,X1:PRINT@856,"+":PRINT@865,X2:PRINT@870,"="
100 V$=INKEY$:IFV$=""THEN 100
105 V=VAL(V$)
110 IF V<1 THEN 100
120 IF V<>1 THEN 160
130 C$=INKEY$:IFC$=""THEN 130
150 V=10+VAL(C$)
160 IF V=X1+X2 THEN GOSUB 200 ELSE GOSUB 500
170 PRINT@832," "
180 GOTO 80
200 ' RIGHT
210 FOR Y=1 TO YC
220 SET(50,Y)
230 FOR Z=1 TO 100:NEXT
240 RESET(50,Y)
250 NEXTY
260 FOR X=39 TO 66:SET(X,YC):NEXT
265 YC=YC-1
267 IF YC=10 THEN 280
270 RETURN
280 Y=4:SET(88,Y):SET(89,Y):SET(99,Y):SET(100,Y)
290 FORY=6 TO 8:SET(94,Y):SET(95,Y):NEXT
300 FOR X=92 TO 97:SET(X,8):NEXT
310 X=86 :FORY=9TO13:SET(X,Y):X=X+1:NEXT
320 FOR X=90 TO 98:SET(X,13):NEXT
322 X=99:FORY=13TO9STEP-1:SET(X,Y):X=X+1:NEXT
325 FOR Z=1 TO 1000:NEXT
330 RUN
500 'WRONG
501 IF YC=22 THEN RETURN
505 GOTO 570
510 FOR Y=24 TO 28
520 SET(58,Y):FORZ=1TO100:NEXTZ:RESET(58,Y)
530 NEXT
540 FOR X=59 TO 126 STEP2
550 SET(X,28):FORZ=1TO100:NEXTZ:RESET(X,28)
560 NEXT
565 RETURN
570 FOR X=39 TO 66:RESET(X,YC+1):NEXTX
580 YC=YC+1
590 GOTO 510
9999 GOTO 9999
```

Program Listing 2. Math Program

bribe her to quit and come to dinner.

When you run the math program, a cup appears in the middle of the screen, one pipe leads to the cup, and another pipe leads away from the cup. At the bottom of the screen there is an addition problem. The problem is to add the two numbers, each between 1 and 7. If the answer is correct, you see a drop moving slowly through the first pipe, then falling into the cup. When the drop hits the bottom, it spreads out, and another level of liquid is added. If the answer is wrong, one level of liquid is erased, and a drop starts moving through the second pipe. Just before the cup overflows, when you have answered at least 12 problems correctly, a smiling face appears, and the whole cup is drained. Then the program starts from the beginning with another problem and an empty cup. ■

"My mother had to bribe her to quit."

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Convergem

by James A. Sanford

When you need to adjust the resolution of your color television, don't buy a special signal generator. Instead, use your Color Computer.

To obtain all the resolution that is possible with Radio Shack's Color Computer, you must properly adjust your color television. Those familiar with color televisions know that adjusting Convergem requires a special signal generator to produce the required patterns. These generators are available in manufactured or kit form but are not cheap.

The Color Computer can generate suitable patterns at no extra cost. Convergem generates a black-and-white (buff) screen for adjusting gray scale; color bars for adjusting intensity and tint (or hue); and vertical, horizontal, or cross hatch patterns for dynamic convergence adjustments. A dot pattern is available for static convergence, and the center dot is circled, making it easy to find. A large circle is available for checking linearity.

The program prints a title header and then a menu. Select the desired pattern by pressing the corresponding key. To see another listing of the menu, press M. You don't have to press the enter key, because the program continuously scans the keyboard, allowing display of the pattern without disruption. Next, select the pattern you need for making the adjustment, and adjust the television in accordance with the manufacturer's instructions.

You should first adjust gray scale, centering, and height/linearity. Then check purity followed by static convergence at the center of the screen. After adjusting static convergence, recheck purity. The next adjustment is dynamic convergence, using the vertical, horizontal, or cross hatch patterns. This is a time-consuming process, but is well worth it because it pays off in sharp, well-defined lines free of colored fringes. When adjusting the static or dynamic convergence, set the color intensity to minimum.

A word about safety is in order. The high voltages in a color television *are lethal and will kill you.* If you don't have experience working inside a television, *do not* remove the back. Instead, use this program to determine whether or not adjustment is necessary, and call a

Program Listing

```
4 CLS
5 GOSUB45
6 GOTO50
10 PMODE4,1
20 SCREEN1,1
30 COLOR5,0
40 PCLS
45 RETURN
50 PRINT @ 12,"CONVERGE"
60 PRINT@39,"BY JAMES A SANFORD"
70 PRINT@73,"COPYRIGHT 1981"
75 PRINT:PRINT:PRINT"THIS PROGRAM WILL PROVIDE":PRINT"VARIOUS PA
TTERNS TO AID COLOR":PRINT"TELEVISION ADJUSTMENT."
80 PRINT@327,"PRESS 'M' FOR MENU"
100 A$=INKEY$
110 IFA$="M"THENGOSUB200
120 IFA$="B"THENGOSUB300
130 IFA$="C"THENGOSUB400
140 IFA$="X"THENGOSUB800
150 IFA$="D"THENGOSUB900
160 IFA$="H"THENGOSUB500
170 IFA$="V"THENGOSUB600
180 IFA$="O"THENGOSUB1000
185 IFA$="E"THENGOTO1030
187 IFA$="R"THENGOSUB1021
190 GOTO100
200 PCLS:CLS
210 PRINT@4,"PRESS":PRINT@16,"TO OBTAIN"
```

Listing continues

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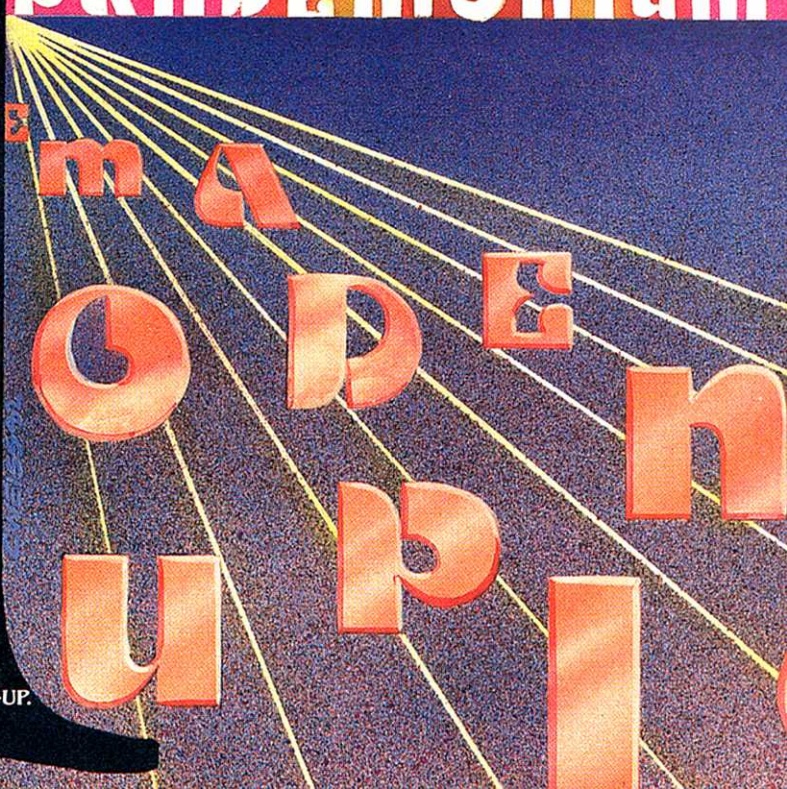

Listing continued

```
215 PRINT@38,"M":PRINT@48,"MENU":PRINT@70,"B":PRINT@80,"COLOR BA
RS":PRINT@102,"C":PRINT@112,"CENTERING"
220 PRINT@134,"X":PRINT@144,"CROSS HATCH":PRINT@166,"D":PRINT@17
6,"DOTS":PRINT@198,"H":PRINT@208,"HORIZONTAL LINES"
230 PRINT@230,"V":PRINT@240,"HORIZONTAL LINES":PRINT@262,"O":PRI
NT@272,"CIRCLE":PRINT@294,"E":PRINT@304,"END":PRINT@326,"R":PRIN
T@336,"RASTER"
240 RETURN
300 CLS:SCREEN0
310 FORY=0TO31
320 FORX=0TO63
330 SET(X,Y,(INT(X/8)+1))
340 NEXTX
350 NEXTY
351 PRINT@97,"G";:PRINT@129,"R";:PRINT@161,"E";:PRINT@193,"E";:P
RINT@225,"N";:PRINT@101,"Y";:PRINT@133,"E";:PRINT@165,"L";:PRINT
@197,"L";:PRINT@229,"O";:PRINT@261,"W";:PRINT@105,"B";:PRINT@137
,"L";:PRINT@169,"U";:PRINT@201,"E";:PRINT@109,"R";
352 PRINT@141,"E";:PRINT@173,"D";:PRINT@113,"B";:PRINT@145,"U";:
PRINT@177,"F";:PRINT@209,"F";:PRINT@117,"C";:PRINT@149,"Y";:PRIN
T@181,"A";:PRINT@213,"N";:PRINT@121,"M";:PRINT@153,"A";:PRINT@18
5,"G";:PRINT@185,"E";:PRINT@217,"N";:PRINT@249,"T";
353 PRINT@281,"A";:PRINT@125,"O";:PRINT@157,"R";:PRINT@189,"A";:
PRINT@221,"N";:PRINT@253,"G";:PRINT@285,"E";
360 RETURN
400 GOSUB10
410 DRAW"BM128,96U95D190U95L127R254BL127E127G254BM128,96F127H254
"
430 RETURN
500 GOSUB10
510 FORY=12TO180STEP14
520 LINE(0,Y)-(256,Y),PSET
530 NEXTY
540 RETURN
600 GOSUB10
610 GOSUB700
620 RETURN
700 FORX=2TO254STEP14
710 LINE(X,0)-(X,192),PSET
720 NEXTX
730 RETURN
800 GOSUB500
810 GOSUB700
820 RETURN
900 GOSUB10
910 FORX=2TO254STEP14
920 FORY=12TO180STEP14
930 PSET(X,Y,5)
940 NEXTY,X
950 CIRCLE(128,96),7,5
960 RETURN
1000 GOSUB10
1010 CIRCLE(128,96),92,5
1020 RETURN
1021 GOSUB10:PCLS5:RETURN
1030 CLS:END
```

professional.

Even if you have worked on televisions, but have never done convergence, either call a professional or do it under the supervision of someone who knows how. These adjustments are critical, interactive, and time consuming, and a great deal of practice is necessary to become proficient. If in doubt, get help.

The program consists of several subroutines. Each pattern is generated by a subroutine, and pattern selection is also accomplished by a subroutine. The patterns for centering and color bars are similar to those in the Radio Shack owner's manual.

When the program is first run, it prints the title and then goes to the pattern selection subroutine. It then prints the menu and waits for input from the keyboard. Control is then passed to the pattern-generator subroutine and is then returned to the input routine. Once the pattern is generated in memory for continuous display, the program waits for input from the keyboard. This is accomplished by using the INKEY$ function. If you select a new pattern, it will be displayed until replaced. The program runs continuously until terminated by pressing E or break.

You can easily add custom patterns or displays. Add the appropriate characters to the keyboard input routine and write the appropriate subroutines to generate the display. ■

James Sanford (509 Forest Drive, Casselberry, FL 32707) works for the U.S. Navy. His hobbies include amateur radio and photography.

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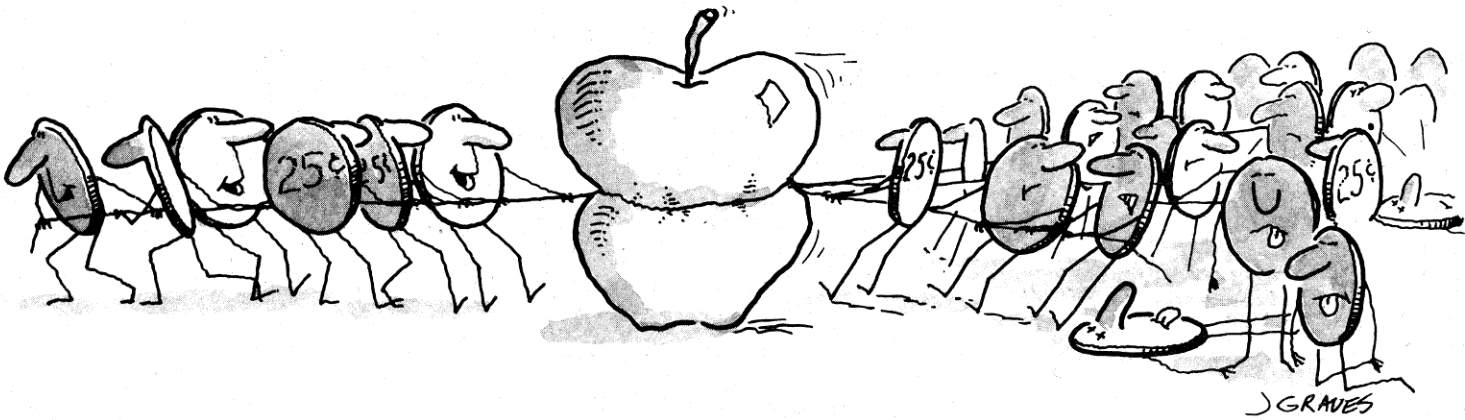

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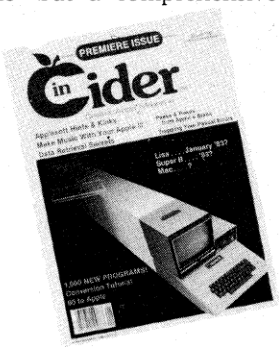

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APL Primer—Part III

by Margaret M. Grothman

This month's installment contains a bonanza of functions: Logical operators, shaping, indexing, and reduction are just a sample.

APL programs (user-defined functions) can be niladic, monadic, or dyadic. A niladic program is called by entering its name only. The programs Fahren and Cone (from Part I of this series) were of this type.

```
)DEF FAHREN
1: 32+(9%5)■X CEL
)DEF CONE
1: 'THE AREA OF THE BASE IS'
2: 3.1416■X RAD * 2
3: 'THE VOLUME OF THE CONE IS'
4: (3.1416%3)■X (RAD * 2)■X HT
```

A monadic program requires one argument. Let's rewrite the program Fahren in monadic form. The first name in the title line is the name of the function, the second is the variable name for the data that will be input.

```
)DEF FAHREN CEL
1: 32 + (9%5)■X CEL
```

To call a monadic program, type the name followed by the value or values of CEL.

```
Enter:    FAHREN 0
Result:   32
Enter:    TEMP←0 2 4 6 8 10
Enter:    FAHREN TEMP
Result:   32  35.6  39.2  42.8  46.4  50
```

Notice that typing the name Fahren alone without a value produces a syntax error.

A dyadic program requires two arguments, one before and one after the name. Let's rewrite Cone in dyadic form. In this form, the title line contains three names. The first and the third are the variable names and the middle one is the function name.

```
)DEF RAD CONE HT
1: 'THE AREA OF THE BASE IS'
2: 3.1416■X RAD * 2
3: 'THE VOLUME OF THE CONE IS'
4: (3.1416%3)■X (RAD * 2)■X HT
```

To find the area and volume of a cone with radius of 3 and height of 4,

```
Enter:   3 CONE 4
Result:  THE AREA OF THE BASE IS
         28.2744
         THE VOLUME OF THE CONE IS
         37.6992
```

Local and Global Variables

Fahren as written above does not save the Fahrenheit temperature that it computes in line 1. You can correct this by assigning the results of the computation to a variable. That value is then available outside Fahren—it can be used in another operation or called by another program. Change the program to read:

```
)DEF FAHREN CEL
1: F←32+(9%5)■X CEL
2: F
```

The second statement is needed to display the value of F, since the assignment statement does not do that.

Since the variable F is used inside Fahren, and is also available to other programs, it is called a global variable. The variable CEL in this program is a local variable; its value is not available outside Fahren. Prove that to yourself by entering CEL.

In the niladic version of Fahren, the value of CEL must be assigned before calling Fahren. Since it is assigned elsewhere, it can be used elsewhere. It is a global variable.

Another example of a niladic program is the Turtles program presented in Part II of this series. No data is required for Turtles, so it can't be rewritten in monadic or dyadic form. The program uses three variables: ROW1, ROW2, and INDEX. Although they originate inside the program, they are

global variables and carry values out of the program when it has been executed.

```
)DEF TURTLES
1:  ROW1←184 190 191 191 188 184 140
2:  ROW2←130 129 128 128 131
3:  INDEX←1
4:  # ROW1
5:  # ROW2
6:  INDEX←INDEX+1
7:  →(INDEX <8)/4
```

If you want the three variables to be treated as local variables, change the form of the title line to)DEF TURTLES; ROW1; ROW2; INDEX.

It's a good idea to treat any variables as local unless you have a specific global purpose in mind. In this way, you can use the variable names in another program without danger that they will carry in unwanted values.

Programs with Explicit Results

Fahren as written can be called directly, but it cannot be used within another operation. To do that, you must rewrite Fahren to produce an explicit result. At first this seems like the version above, but in a program with an explicit result, the form of the title line is different.

```
)DEF Z←FAHREN CEL
1:  Z←32+(9%5)×X CEL
```

Unlike F in the last example, the variable Z is local; it does not pass its value outside of the function Fahren. Now that the program has an explicit result, you can call it directly (you could do this with the above version, too), or you can use it in another operation or program.

```
Enter:  TEMP←FAHREN 10
Enter:  TEMP
Result: 50
```

When a program is written with an explicit result, that result will be displayed. A separate line naming it is not needed.

Reduction

The reduction function is used only with vectors. It uses the slash symbol preceded by another symbol. When combined with a plus sign, all elements of the vector are added. For example, +/5 3 9 7 is evaluated in the same way as 5+3+9+7. The following example computes the mean of five numbers.

```
Enter:  VEC←2 4 6 8 10
Enter:  N←5
Enter:  (+/VEC)%N
Result: 6
```


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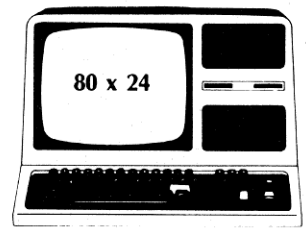

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If the parentheses are omitted, each element of the vector is divided by five before reduction is done. In the example above, the result is the same either way. Usually, however, a reduction operation should be enclosed by parentheses to ensure that reduction is done before the other operations.

Reduction can also be used with multiplication, using the symbols shift X/.

```
Enter:  CUBE←2 3 4
Enter:  ■X/CUBE
Result: 24
```

Reduction can also be used with subtraction and division, but it is probably better not to try. Because reduction is performed in right-to-left order, the results are hard to predict. For example, % / 36 24 12 6 would be executed in the following way:

```
12%6=2
24%2=12
36%12=3
```

It is difficult to think of an application for this computation where the hazards do not outweigh the benefits.

Reduction with Maximum and Minimum Functions

Reduction in combination with the maximum function returns the highest number in the vector. Minimum reduction returns the lowest number.

```
Enter:  VEC←1 2 3 4 5 6 7 8 9 10
Enter:  ■H/VEC
Result: 10

Enter:  ■L/VEC
Result: 1
```

Reduction with Logical Operators

AND reduction yields a result of one only if all elements of a vector are one. OR reduction yields zero only if all elements are zero. NAND reduction produces zero if all elements are one; NOR reduction produces one if all elements are zero.

Here is an example of AND reduction:

```
→(1=&/B)/5
```

Read: "Go to statement 5 if all elements in vector B are true."

Index Generator (Monadic)

The index generator, which uses the symbol shift L, produces a vector consisting of the integers one through the argument.

```
Enter:  ■I 5
Result: 1 2 3 4 5
```

The next example combines the sum reduction and the index generator functions. First, a five-element vector is produced, and then its elements are added together.

```
Enter:  +/■I 5
Result: 15        (sum of 1 through 5)
```

Shape Function (Monadic)

The shape function produces the number of elements in a vector. When applied to a literal vector, shape works like LEN$ in Basic. It counts the number of characters, including embedded spaces. The symbol is shift P.

```
Enter   ■P'JOHN JONES'
Result: 10
```

The following example computes the mean of the elements in a vector. It is more efficient than the mean done earlier because you don't have to count and enter the number of elements as a separate value.

```
Enter:  VEC←2 4 6 8 10
Enter:  +/VEC%■P VEC
Result: 6
```

Reverse Function (Monadic)

This function reverses the elements in a vector. Shift R is the symbol. The example below uses both the reverse function and the index generator. Working from right to left, the index is generated, then it is reversed.

```
Enter:  ■R■I 9
Result: 9 8 7 6 5 4 3 2 1
```

Reshape Function (Dyadic)

Reshape (shift P) constructs a vector consisting of identical elements. Its size is indicated by the first argument.

```
Enter:  5■P5
Result: 5 5 5 5 5
```

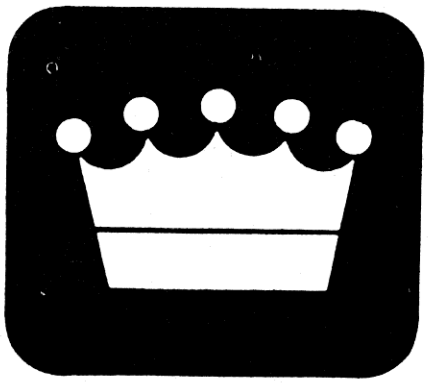
Reshape can also create a vector consisting of graphics characters. Try 5■P#191.

If more than one number or character follows the symbol, they will alternate in the vector that results. Try 60■P'%-'.

The next example shows how the

```
)DEF TEST
 1:  #28; #31
 2:  I←1
 3:  SCORE←0
 4:  'FOR EACH STATEMENT, ENTER T OR F.'
 5:  'APL STANDS FOR ALL-PURPOSE LANGUAGE.'
 6:  ANSWER
 7:  'ON A STANDARD APL KEYBOARD, THE GREEK LETTER RHO'
 8:  'IS USED FOR THE SHAPE AND RESHAPE FUNCTIONS.'
 9:  ANSWER
10:  'APL CANNOT BE USED TO PRODUCE SCREEN GRAPHICS.'
11:  ANSWER
12:  'A USER-DEFINED FUNCTION MUST HAVE AN EXPLICIT RESULT'
13:  'IF IT IS TO BE CALLED BY ANOTHER FUNCTION.'
14:  ANSWER
15:  'VARIABLES USED IN A USER-DEFINED FUNCTION ARE'
16:  'LOCAL UNLESS THEY ARE INCLUDED IN THE TITLE LINE.'
17:  ANSWER
18:  'YOUR SCORE IS';SCORE;'RIGHT OUT OF';P KEY;'QUESTIONS.'
)DEF ANSWER; RES
 1:  KEY←1 1 0 1 0
 2:  RES←■M
 3:  →(RES='T')/TRUE
 4:  RES←0
 5:  →COMPARE
 6:  TRUE: RES←1
 7:  COMPARE→(KEY(I) $ RES)/ WRONG
 8:  'CORRECT!'
 9:  SCORE←SCORE+1
10:  →INDEX
11:  WRONG: 'THAT IS NOT THE RIGHT ANSWER.'
12:  I←I+ 1
```

Program Listing



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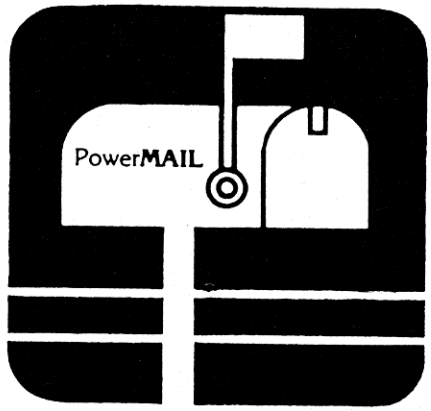

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reshape function can be used to duplicate the Basic LEFT$ function.

```
Enter:   NAME←'1. MISS PIGGY'
Enter:   NUMBER←2∊P NAME
Enter:   NUMBER
Result:  1.
```

Indexing Function (Monadic)

This function is written like a subscript following a vector name, that is, a value is enclosed in parentheses. The value within parentheses indicates which elements of the vector will be returned. Thus, VEC(4) returns the fourth element of the vector VEC.

More than one value can be accessed. VEC(2 3) produces a vector consisting of the second and third elements of VEC. An expression can also be used within the parentheses. VEC(1+2) returns the third element of the vector VEC.

The next example combines multiplication reduction with indexing.

```
Enter:   VEC←1 2 4 8 16 32 64
Enter:   ∊X/VEC(2 4)
Result:  16
```

The next example selects a random character from a literal.

```
Enter:   LETTERS←'ABCDEFGHI
         JKLMNOPQRSTUVWXYZ'
Enter:   LETTERS(?26)
```

An index variable may be assigned a new value. You can change selected elements of a vector in this way.

```
Enter:   NAME←'MISS PIGGY'
Enter:   NAME(2 3 4)←'RS.'
Enter:   NAME
Result:  MRS. PIGGY
```

The indexing function and the index generator can be used together as another way to duplicate the LEFT$ function.

```
Enter:   LETTERS(∊I 5)
Result:  ABCDE
```

One more example:

```
)DEF WORDSCRAMBLE
1:  QUESTION←'ZUEPZL'
2:  QUESTION
3:  ANSWER←QUESTION (4 2 1 5 6 3)
```

To play, enter the name Wordscramble. To see the answer, type "answer."

Quad

I introduced the quad symbol in Part I as a way to perform a computation and print the result in a single statement.

```
Enter:   ∊Q←-3+4∊X7∊X2
Result:  53
```

When quad is used on the right side of an assignment statement, it produces an input prompt.

```
)DEF MULT; ANS
1:  START:'10X3='
2:  ANS←∊Q
3:  →(ANS=30)/RIGHT
4:  'WRONG';→START
5:  RIGHT:'YOU ARE RIGHT.'
```

Line 4 contains two statements separated by a semicolon. If you use multiple-statement lines, be sure the first statement is not a branch or a conditional statement.

To improve the appearance of this program, press the down arrow after 'WRONG'. The repeat question will then appear on a separate line.

Note the format of the title line. ANS is a local variable because it is named in the title line and separated from the program name by a semicolon.

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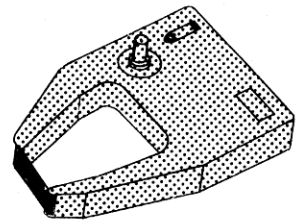

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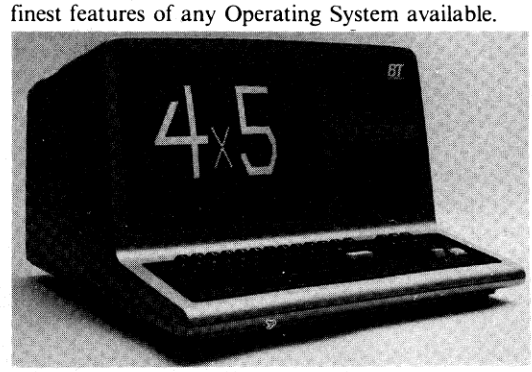

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Literals can be used with quad, but they must be enclosed in single quotes. A variation of quad is quote quad, produced by typing shift M. Quote quad allows the use of literals without single quotes. No prompt is displayed.

Membership Function (Dyadic)

The membership function (shift E) is a way of asking whether a character or a variable is a member of a set. For example, 'A'∊E 'ABCDE' asks if A belongs to the set 'ABCDE'. Since it does, a one is returned.

```
4∊E∊I 9
Read: "Is 4 a positive integer between 1 and 9?"
4.2∊E∊I 9
Read: "Is 4.2 a positive integer between 1 and 9?
```

In the second example, a zero will result, because 4.2 is not a member of the set.

If the argument to the left of E is a vector, then the resulting vector will consist of ones and zeros, indicating for each element of the original vector whether it is a member of the vector following ∊E.

```
Enter:  DIGITS←'0123456789'
Enter:  'R2D2'∊E DIGITS
Result: 0 1 0 1
```

Take Function (Dyadic)

The take function (up arrow) strips elements off the left side of a vector.

```
Enter:  LEFT←∊I 5
Enter:  2↑LEFT
Result: 1 2
```

Although you have seen two other ways of duplicating the Basic LEFT$ function, this is the most direct method.

Take can also be used with literals. It could be used, for example, to restrict names in a mailing list to a certain length.

```
Enter:  NAME←'YOUR NAME IS TOO
        LONG'
Enter:  18↑NAME
Result: YOUR NAME IS TOO L
```

Characters can be taken off the right side by using a negative integer with take.

```
Enter:  ¯18↑NAME
Result: R NAME IS TOO LONG
```

Drop Function

Drop (shift, down arrow) also removes elements from a vector, but it returns the remainder of the vector, not the stripped-off items.

```
Enter:  INDEX←∊I 5
Enter:  2↓INDEX
Result: 3 4 5
```

Used with a negative number, drop removes elements from the right side.

```
Enter:  ¯2↓INDEX
Result: 1 2 3
```

The last example appears to be the same as 3↑INDEX. However, there are situations in which only one of the two functions will work. For example, if the length of INDEX is not known, and you want to remove two elements from the left side, only drop would do the job.

Grade-up (Monadic)

The grade-up function, like the take function, uses the up-arrow symbol. Use it to arrange the elements of a vector from lowest to highest. The ordering is not done directly by grade-up. Instead, a vector is produced that is the index of the correct order. Here is an example:

```
Enter:  VEC←2 1 ¯4 7 3 9 ¯8
Enter:  ↑VEC
Result: 7 3 2 1 5 4 6
```

The lowest element of VEC is ¯8. Since that number would appear first if the vector were rearranged, a seven is the first digit in the index vector, indicating that the seventh element would be the first listed if the vector were reordered from low to high.

To do the actual reordering, use ↑VEC to index VEC, as follows:

```
Enter:  VEC(↑VEC)
Result: ¯8 ¯4 1 2 3 7 9
```

Grade-down (Monadic)

Grade-down is the reverse of grade-up. Its symbol is produced by typing shift, down arrow, and it produces an index vector for rearranging the elements of a vector from highest to lowest.

```
Enter:  ↓VEC
Result: 6 4 5 1 2 3 7
Enter:  VEC(↓VEC)
Result: 9 7 3 2 1 ¯4 ¯8
```

Both grade-up and grade-down can be used with literals.

```
)DEF YOURNAME
1:  'ENTER YOUR NAME'
2:  NAME←∊M
3:  NAME(↑NAME)
4:  NAME(↓NAME)
```

Index Of (Dyadic)

This function is used to locate a value within a list. The argument before the symbol, shift I, is the name of the list; the argument following the symbol is the name of the value or variable being searched. When the search is for a literal, it must be enclosed in single quotes.

```
Enter:  NAME←'GEORGE P. SMITH'
Enter:  NAME∊I'.'
Result: 9
```

The resulting integer indicates the position of the period character within NAME. If the character appears more than once, only the first position is returned.

```
Enter:  NAME∊I'E'
Result: 2
```

The next example removes the middle initial from a name. Line 1 locates the initial. Lines 2 and 3 isolate the first and second names through the use of the take and drop functions.

```
)DEF SHORTNAME; I; F; S
1:  'ENTER A NAME CONTAINING AN
INITIAL'
2:  NAME←∊M
3:  I←NAME∊I'.'
4:  F←(I__2)↑NAME
5:  S←(I+1)↓NAME
6:  F,S
```

The last program (see the listing) is a true-false test. The main program is called Test, and it uses a subprogram called Answer. The questions are put into the main program, and the answer key is entered in Answer as a vector assigned to the variable KEY. KEY contains ones and zeros corresponding to true and false answers.

Answer receives the student's response in line 2, converts the letter response to a one or a zero in lines 4 and 6. The response is compared to the answer key in line 7 to determine the appropriate message. In line 11, RES is added to SCORE to accumulate the number of correct answers.

The questions and responses will be easier to read if lines are inserted between them. To do this, press the down arrow before the second single quote in statement 4 of Test, and in statements 8 and 11 of Answer. ■

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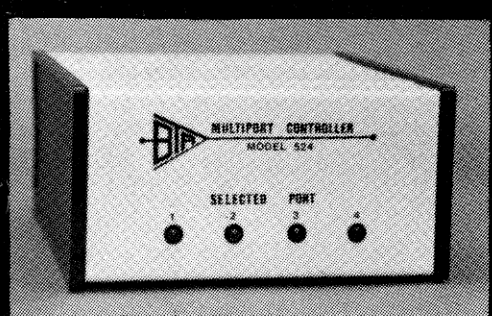

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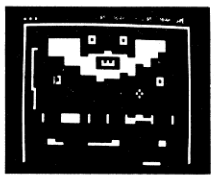

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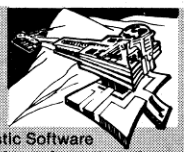

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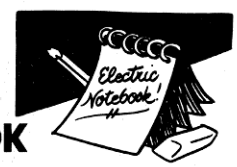

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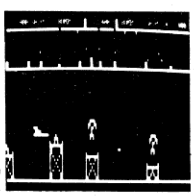

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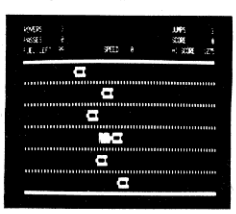

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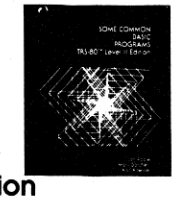

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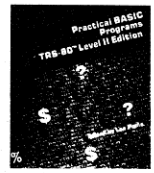

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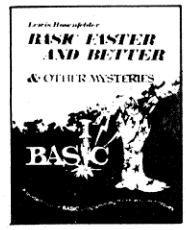

By Lewis Rosenfelder from ILG

One of the most useful books ever published for TRS-80 owners. Contains a wealth of information on how to optimize your programs with special techniques. Includes libraries of functions and subroutines that can eliminate most of the drudgery of writing programs — you can write complete programs as a series of subroutine calls! With the optional library and demonstration disks, you'll have all these tools at hand without having to type them from the text.

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WARNING: some of the hardware modifications in this book will void any warranties and may cause Radio Shack to refuse repairs on modified equipment.

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Twinkle, Twinkle, Little Star

by Bill Grout

Who says a computer can't write? With a little bit of help from you, and some imaginative graphics, the TRS-80 becomes a poet.

Program Listing 1. "In a World Like This One"

```
5 CLS
10 PRINT"IN A WORLD LIKE THIS ONE"
20 PRINT "By Bill Grout"
30 FOR X=1 TO 800:NEXT X
40 CLS
45 PRINT"For my parents"
46 FOR X=1 TO 800:NEXT X
47 CLS
50 FOR X=1 TO 800:NEXTX
60 PRINT"                You don't believe you
                          did much in life"
70 FOR X=1 TO 1000: NEXT X
80 PRINT"                But it isn't true"
90 FOR X=1 TO 700: NEXT X
100 PRINT"               in a world like this one"
110 FOR X=1 TO 1000:NEXT X
120 CLS
130 FOR X=1 TO 200:NEXT X
140 PRINT"        You raised six honest and hard
                   working sons and a daughter"
150 FOR X=1 TO 1200:NEXT X
160 CLS
170 FOR X=1TO400:NEXT X
180 PRINT "        who are not perverts or criminals"
190 FOR X=1 TO 800:NEXT X
200 PRINT"         Nor who have psychological problems"
210 FOR X=1 TO 800:NEXT X
220 CLS
230 FOR X=1 TO 500: NEXT X
240 PRINT"            nor who love power";:FOR X=1 TO 400: NEXT X
:PRINT:PRINT"                        money";: FOR X=1 TO 200:NEXT X

PRINT:PRINT"                                  or"
250 FOR X=1 TO 400:NEXT X
```

Listing 1 continues

Computers can read poems to you with surprisingly effective results. In fact, a computer can inject motion and graphics into a poem, offering avenues of expression not yet explored.

Professional poets may soon look into writing computer poems if for no other reason than to prove they can be technological, too. All you need to know is a little about programming in Basic.

Select a poem that you like; I selected a poem called "The Star" because I thought the computer could easily add graphics. When I began programming "The Star" on the computer, I discovered several things.

First, lines of the poem should appear on the screen, stay there long enough for the reader to understand them without being rushed, then they should go off and new lines appear. How much of the poem appears on the screen at a time varies to make the reading more inter-

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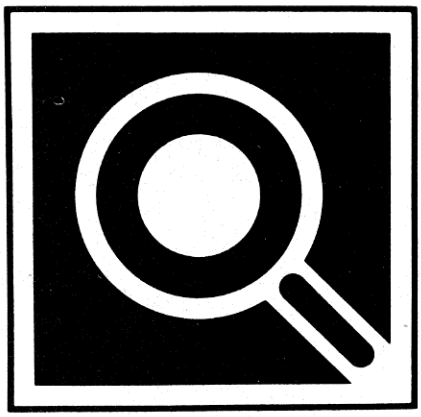

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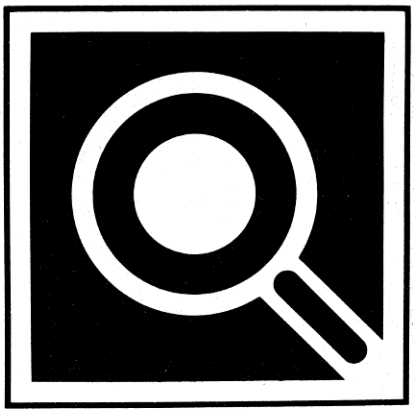

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✓83

esting. Displaying long blocks of words was less interesting to read than short segments of the poem that change regularly.

By programming the lines in a certain rhythm, you can imitate the way a poem might actually be read. It also allows you to project movement on the screen, something that no printed page allows.

The main programming problem is getting the rhythm of the display to read correctly. You can alter the length of time a line stays on the screen by using a print statement, then creating a pause using a For...Next loop. By experimenting, you can space the lines of poetry with different lengths of pauses. I found that I frequently use the following For...Next statements:

```
FOR X=1 TO 1000:NEXT X
FOR X=1 TO 800:NEXT X
```

Because I was typing in these two statements quite often, I made them into subroutines and referred to them with GOSUB statements.

If you refer to lines 10–40 of "The Star" program you will see that I begin with the title and my name, and then use the pause subroutine twice. This gives the viewer time to read the title and to create a short pause before the poem begins. In essence, determining how long the viewer will see the lines displayed on the screen is the major programming task. Because the length of the lines of poetry change, you have to experiment with different sizes of For...Next loops.

You must also consider where the lines will appear on the screen. Lines 10 and 20 place the title and author of the poem in the upper left corner. With lines 50 and 70, you can position the poem's lines to the right, toward the center, by adding blank spaces within the quotes of the print statement. By using a statement like:

```
10 PRINT:PRINT"          THE STAR"
```

you could print the poem's title two lines down and 10 spaces to the left. In this way you can position the lines where you want them vertically and horizontally. You can also use PRINT@ statements as in line 310 to print "Venetian blind." Because I was unfamiliar with the display positions of PRINT@ statements, I just typed blank spaces between quotes to put text where I wanted. PRINT@ statements are invaluable if you want certain graphics effects, and I use a number of PRINT@ statements in "The Star."

Graphics effects are part of the fun of putting a poem on the screen. Because the poem is about stars, I thought a star or two falling out of the sky would be interesting. This happens in lines 130 and 140.

You'll find a second attempt at graphics in lines 290–340. Here I tried to compare looking through falling snow to looking through a Venetian blind. You decide if this graphics display is effective. Whatever the result, your imagination and your programming abilities can add motion and interest to a poem.

One thing worth mentioning is what you don't see on the screen. Because things turn on and off, the reader has to be assured that there will be enough time to understand the text before it scrolls off screen. And, when it disappears, the reader may need time to think about it. Therefore, between segments of the poem, you can place For...Next loops that leave the screen blank and give the reader time to reflect. Just as a comedian needs timing to tell a joke and get a laugh, you can improve the punch lines of your poem by lengthening or shortening the time before the next lines appear.

"The Star" may not be a masterpiece, but if you're like me, you will enjoy experimenting with the computer and seeing your name in lights. ■

Bill Grout can be reached at 380 Channing Way, #171, San Rafael, CA 94903.

Listing 1 continued

```
260 PRINT "                                  perpetrate violence"
270 FOR X=1TO 1000:NEXT X
280 CLS
290 FOR X=1 TO 400:NEXT X
299 PRINT:PRINT:PRINT:PRINT
300 PRINT"          You did not conquer continents"
310 FOR X=1 TO 800:NEXT X
330 PRINT"          in a world like this one"
340 FOR X=1 TO 800:NEXT X
355 PRINT
360 PRINT "          You set six people free."
370 FOR X= 1TO 2000:NEXT X
380 CLS
390 FOR X= 1TO 2000: NEXT X
400 END
```

Program Listing 2. "Storm Poem"

```
5 CLS
10 PRINT "STORM POEM"
20 PRINT"By Bill Grout"
30 FOR X=1 TO 800:NEXT X
40 CLS
45 PRINT "For Kearney in Algeria"
46 FOR X=1 TO 800: NEXT X
47 CLS
50 FOR X=1 TO 800:NEXT X
60 PRINT" She rides it out easily"
70 FOR X=1 TO 800:NEXT X
80 PRINT"My wife eating chocolates"
90 FOR X=1 TO 800:NEXT X
100 PRINT "licks her fingers like a cat"
110 FOR X=1 TO 1000:NEXT X
115 FOR X=1 TO 2
120 PRINT "LIGHTENING FLASH"
130 CLS
140 NEXT X
150 PRINT "LIGHTENING FLASH"
160 FOR X=1 TO 800: NEXT X
170 CLS: FOR X=1 TO 300:NEXT X
175 FOR X=1 TO 3
180 PRINT"White cheese cloth curtains light up"
190 PRINT"with the blink of flourescent tube coming on"
191 CLS:NEXT X
192 PRINT "White cheese cloth curtains light up"
193 PRINT "with the blink of flourescent tube coming on"
200 FOR X=1 TO 2100: NEXT X
210 CLS
220 FOR X=1 TO 600:NEXT X
230 PRINT"Empty barrel rolling on its side"
```

Listing 2 continues

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Listing 2 continued

```
260 FOR X=1 TO 1000: NEXT X
270 CLS
280 FOR X=1 TO 200:NEXT X
290 PRINT" Unruly radio:  clicks and"
291 FOR X=1 TO 800:NEXT X
295 FOR X=1 TO 20: PRINT@30,"**";:PRINT@50,"**"
296 CLS: PRINT@32,"electric drizzle":CLS
297 NEXT X
300 FOR X=1 TO 1200:NEXT X
310 CLS
320 FOR X=1 TO 300:NEXT X
330 PRINT "In storm weather"
340 FOR X=1 TO 500:NEXT X
350 PRINT "                read history"
360 FOR X=1 TO 500:NEXT X
370 PRINT"   short poems"
380 FOR X=1 TO 400:NEXT X
390 PRINT "a catalogue"
400 FOR X=1 TO 800:NEXT X
410 CLS
420 FOR X=1 TO 400: NEXT X
421 PRINT:PRINT
430 PRINT "     One candle burning on the table waiting"
440 FOR X=1 TO 1000: NEXT X
```

```
5 CLS
10 PRINT "TIME"
20 PRINT"By Bill Grout"
30 FOR X=1 TO 800: NEXT X
40 CLS
50 FOR X=1 TO 800: NEXT X
60 PRINT "You put your head on"
80 PRINT"the rail road track and"
85 FOR X=1 TO 1000:NEXT X
90 PRINT "listen": FOR X=1 TO 800:NEXT X:PRINT@145,"Your heart"
95 FOR X=1 TO 300:NEXT X
96 PRINT"beating quick as a bird's"
100 FOR X=1 TO 1000:NEXT X
110 PRINT"The train is two inches away."
120 FOR X=1 TO 500:NEXT X:CLS
130 PRINT@ 200,"Do you have time to be special?"
140 FOR X=1 TO 800:NEXT X
150 FOR X=200 TO 230:
160 PRINT@X," ":NEXT X
170 FOR X=1 TO 1500:NEXT X
180 END
```

Program Listing 3. "Time"

```
5 CLS
10 PRINT"PROBLEMS"
20 PRINT "By Bill Grout"
30 FOR X=1 TO 800:NEXT X
40 CLS
50 FOR X=1 TO 800: NEXT X
60 PRINT@90,"GEE,"
70 PRINT
80 FOR X=1 TO 800:NEXT X
90 PRINT@210," From the prices
                    you'd think"
100 FOR X=1 TO 800:NEXT X
110 CLS
120 PRINT@340, "The Zulus have

                 taken over the"
130 PRINT
140 FOR X=1 TO 500:NEXT X
150 PRINT@465,"Phone company"
160 FOR X=1 TO 1000:NEXT X
175 FOR X=1 TO 30
180 PRINT@512+X, "The long distance spear."
200 NEXT X
210 FOR X=1 TO 800:NEXT X
220 CLS
230 FOR X=1 TO 1000:NEXT X
240 END
```

Program Listing 4. "Problems"

Program Listing 5. "Master"

```
5 CLS
10 PRINT"MASTER"
20 PRINT"By Bill Grout"
30 FOR X=1 TO 800:NEXT X
40 CLS
50 FOR X=1 TO 800:NEXT X
60 PRINT@20,"I was walking beside"
70 PRINT@84,"a railroad track"
80 FOR X=1 TO 1000:NEXT X
90 PRINT@148,"And I found an

                          ear of cactus"
100 FORX=1 TO 800:NEXT X
110 PRINT
120 PRINT"            someone had knocked off"
130 FOR X=1 TO 1000:NEXT X
140 CLS
```

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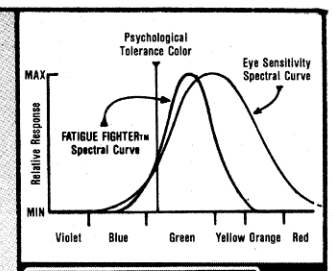

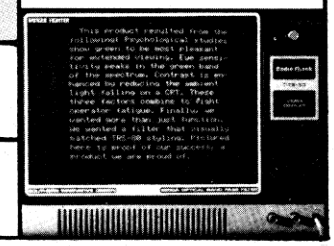

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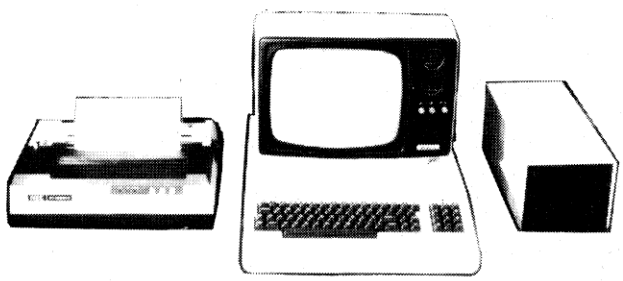

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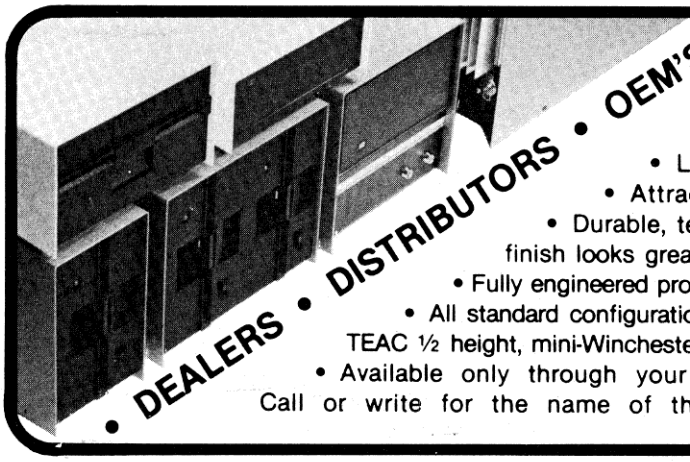

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Listing 5 continued

```
150 FORX=1 TO 300:NEXT X
160 PRINT@20,"It was stranded"
170 FOR X=1 TO 800:NEXT X
180 PRINT@84,"like a stick in a
                        dry river"
190 FOR X=1 TO 800:NEXT X
195 PRINT
200 PRINT"        With one little prickly pear fruit"
210 FOR X=1 TO 500:NEXT X
220 PRINT"        holding on for dear life"
230 FOR X=1 TO 800:NEXT X
340 PRINT:PRINT"          I took pity."
350 FOR X=1 TO 800:NEXT X
360 CLS:PRINT:PRINT"          I carried the piece home to"
370 FOR X=1 TO 900:NEXT X
380 PRINT"                be my slave."
390 FOR X=1 TO 1000:NEXT X
400 CLS
410 FOR X=1 TO 1500:NEXT X
420 END
```

Program Listing 6. "The Star"

```
10 CLS:PRINT"THE STAR"
20 PRINT"By Bill Grout"
30 GOSUB 8000
40 CLS:GOSUB8000
50 PRINT "    At midnight"  'First line of poem
60 FOR X=1 TO 500:NEXT X
70 PRINT"                  a star"
80 GOSUB8000
90 PRINT"Perhaps my star or your star, we are not sure"
100 FOR X=1 TO 1600:NEXT X
110 CLS:PRINT "Plummeted from the sky"
120 GOSUB8000
130 FOR X=1 TO 800 STEP 64   'First starfall
140 PRINT@X,"*":CLS:NEXT X
150 PRINT"      Leaving behind it the sparkling streak of
                 a match chipped across sandpaper"
160 FOR X=1 TO 2000:NEXT X
170 CLS:PRINT "Where the star fell": FOR X=1 TO 1000:NEXT X:PRIN
T"was undetermined"
180 GOSUB8000
190 PRINT"And so we have gone searching
            in the opposite direction
            in which the trees fell"
200 FOR X=1 TO 2200:NEXT X
210 CLS:PRINT" But some were thrown up like jack straws"
220 FOR X=1 TO 1300:NEXT X:PRINT"by the impact":FOR X=1 TO 700:N
EXT X
230 PRINT"And came down every which way and other craters"
240 GOSUB 1000
250 PRINT "from previous stars confuse the issue."
260 FOR X=1 TO 1200:NEXT X:CLS:FOR X=1 TO 800:NEXT X
270 PRINT"And then the snow comes abrupt
                              as pulling down"
280 GOSUB1000
290 FOR X=1 TO 6      'Snowfall
300 FOR Y=1 TO 50:NEXT Y
310 PRINT@400+(X*64),"a venetian blind"
320 IF X=6 GOTO 350
330 PRINT@400+(X*64),"********************************"
340 NEXT X
350 GOSUB1000
360 CLS:FOR X=1 TO 300:NEXT X
370 PRINT"And this is how we lost you."
380 GOSUB1000
390 CLS:PRINT"Another star fell"
400 GOSUB8000
410 FOR X=1 TO 10        'Starfall #2
420 PRINT@30+(X*64),"*":CLS
430 NEXT X
440 PRINT "        Perhaps yours..."
450 FOR X=1 TO 1200:NEXT X
460 PRINT "You stopped to gaze out over the line
              where you were picking clothespins"
470 FOR X=1 TO 1400:NEXT X
480 CLS:FOR X=1 TO 500:NEXT X
490 PRINT"Many of us were still in the tops of the trees
          in the postures of men drinking from bottles,
          binoculars to our eyes,
          getting the angles, getting the degrees"
500 FOR X=1 TO 2900:NEXT X
510 CLS:FOR X=1 TO 400:NEXT X
520 PRINT "   And it was at that moment that you conceived the s
acrifice"
530 GOSUB1000
540 CLS:FOR X=1 TO 300:NEXT X
550 PRINT"                                to let go"
560 GOSUB8000
570 PRINT"to not try to possess the star"
580 GOSUB1000
590 PRINT "   to create a final beauty"
600 FOR X=1 TO 900:NEXT X
610 FOR X=880 TO 1 STEP -67   'Sparklerfall
620 PRINT@X,CHR$(42)
630 IF X<400 GOTO 650
640 CLS:NEXT X
650 FOR X=400 TO 600 STEP 67
660 FOR Y=1 TO 3
670 IF X>410 PRINT@(X-X*.15),CHR$(42)
680 NEXT Y
700 CLS:NEXT X
710 PRINT@448," (( ) )":PRINT@449,"( ( ) )"
720 PRINT@448,"(        )":PRINT@449,"(            )"
730 CLS:GOSUB8000
```

Listing 6 continues

Listing 6 continued

```
740 PRINT@454," like children throwing sparklers
            out into the sea"
750 FOR X=1 TO 1200:NEXT X
760 CLS:FOR X=1 TO 1200:NEXT X
770 END
1000 FOR X=1 TO 1000:NEXT X
1010 RETURN
8000 FOR X=1 TO 800:NEXT X
8010 RETURN
```

```
10 CLS
20 PRINT"DON'T READ THIS POEM"
30 PRINT "By Bill Grout"
40 FOR X=1 TO 800:NEXT X:CLS:FOR X=1 TO 800:NEXT X
50 PRINT:PRINT:PRINT
60 PRINT "Do not read this there you did it, damn."
70 FOR X=1 TO 1000:NEXT X
80 CLS: PRINT "Now please": FOR X=1 TO 300:NEXT X: PRINT "don't
finish this line"
90 FOR X=1 TO 900:NEXT X
100 CLS: PRINT "You're screwing up my poem, you're supposed"
120 FOR X=1 TO 700:NEXT X: PRINT"to leave one line unread try ag
ain,"
130 FOR X=1 TO 500:NEXT X
140 PRINT "Don't finish this!": FOR X=1 TO 700:NEXT X: PRINT "
     Hell, you did!"
150  FOR X=1 TO 800: NEXT X:CLS: FOR X=1 TO 1000:NEXT X
155 PRINT:PRINT
160 PRINT "          DON'T READ THIS!    "
170 FOR X=1 TO 900:NEXT X: CLS: FOR X=1 TO 500:NEXT X

175 PRINT:PRINT
180 PRINT "    Thanks for your cooperation"
190 FOR X=1 TO 1000:NEXT X
200 CLS: FOR X=1 TO 800:NEXT X
210 END
```

Program Listing 7. "Don't Read This Poem"

```
10 CLS
20 PRINT "POEM OF HOPE"
30 PRINT "By Bill Grout"
40 FOR X=1 TO 800:NEXT X
50 CLS: FOR X=1 TO 800:NEXT X
60 PRINT"       I sleep with a tree beside my bed,"
70 FOR X=1 TO 900:NEXT X
80 PRINT "          a tree for you,":FOR X=1 TO 800:NEXT X
90 PRINT "          next to my pillow"
100 FOR X=1 TO 900:NEXT X
110 PRINT "     a tree as big as your wrist"
120 FOR X=1 TO 900:NEXT X
130 CLS:FOR X=1 TO 400:NEXT X
140 PRINT"  A tree full grown the size of an Easter chick"
150 FOR X=1 TO1100:NEXT X
160 PRINT "  an oak in a teacup"
170 FOR X=1TO 900:NEXT X
180 PRINT " and its limbs don't blow in the wind"
190 FOR X= 1TO 1000:NEXT X
195 CLS:PRINT:PRINT
200 PRINT"       they blow in the prayers."
210 FOR X=1 TO 1000:NEXT X: CLS: FOR X=1 TO 800:NEXT X
220 END
```

Program Listing 8. "Poem of Hope"

Program Listing 9. "My Poetry"

```
10 CLS
20 PRINT "MY POETRY"
30 PRINT "By Bill Grout"
40 FOR X=1 TO 800:NEXT X:CLS:FOR X=1 TO 800:NEXT X
60 PRINT "           Your poems lack"
70 FOR X=1 TO 500:NEXT X: PRINT "                CONTENT! "
80 FOR X=1 TO 800:NEXT X
90 PRINT "           everybody tells me"
100 FOR X=1 TO 500:NEXT X:
120 PRINT:
130 A$="barstool":B$="foxglove":C$="iron on patches"
140 GOSUB2000
150 CLS: FOR X=1 TO 300:NEXT X
160 PRINT "          What can I do?"
170 FOR X=1 TO 400:NEXT X
180 PRINT "           I think    "
190 FOR X=1 TO 300:NEXT X
200 A$="potato peelings": B$="scotch tape     ": C$="living bras
"
210 GOSUB2000
220 CLS:FOR X=1 TO 300:NEXT X: PRINT "     I need to talk"
230 PRINT "      to one of the masters"
240 FOR X=1 TO 900:NEXT X
250 PRINT "    What if it's my heart?"
260 FOR X=1 TO 300:NEXT X
270 A$="asparagus?":B$="turnstile?   ":C$="backdoor?   "
280 GOSUB2000
290 CLS:FOR X=1 TO 400:NEXT X
300 PRINT "          I try to put the stuff"
310 PRINT"         I think "
320 FOR X=1 TO 700:NEXT X
340 A$="barley": B$="pig iron": C$="mistletoe"
```

Listing 9 continues

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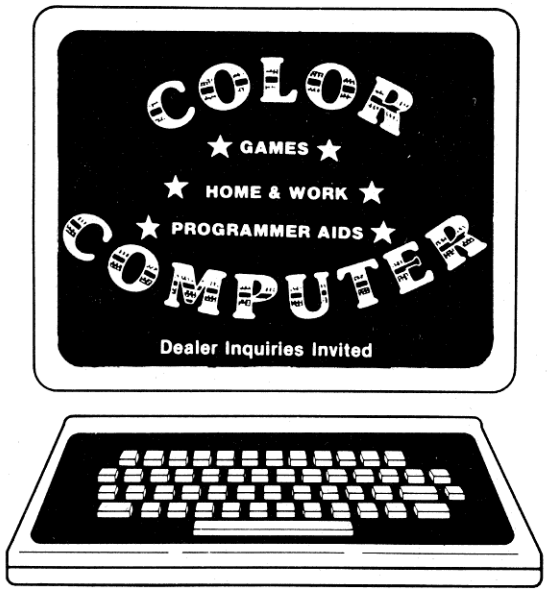

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Listing 9 continued

```
350 GOSUB2000
360 FOR X=1 TO 500: NEXT X:CLS
370 PRINT "  are the real necessities"
380 FOR X=1 TO 400:NEXT X
390 CLS:A$="":B$="& rubber bands": C$="splayed toes    "
400 GOSUB2000
410 FORX=1 TO 200:NEXT X:CLS
420 PRINT "    into it, & well"
430 FOR X=1 TO 600:NEXT X
440 PRINT "here it is, me"
450 PRINT"   & half empty"
460 FOR X=1 TO 900:NEXT X:CLS
470 A$="rainbow":B$="spiderweb":C$="kitchen sink"
475 GOSUB2000
480 FOR X=1 TO 1000:NEXT X
490 CLS: FOR X=1 TO 800:NEXT X
500 END
2000 FOR X=1 TO 3
2200 PRINT:IF X=1 PRINT@270,A$
2300 IF X=2 PRINT@270,B$
2400 IF X=3 PRINT@270,C$
2450 FOR Y=1 TO 300:NEXT Y
2500 NEXT X
2600 RETURN
```

```
10 CLS
20 PRINT "Get 'EM"
30 PRINT "By Bill Grout"
40 FORX=1 TO 100:NEXT X
50 CLS:FOR X=1 TO 800:NEXT X
60 X$="There!"
70 FOR X=1 TO 5
80 PRINT@300+(X*88),X$
90 FOR Y=1 TO 300:NEXT Y
100 CLS:NEXT X
110 X$="ANT!"
120 CLS: FOR X=1 TO 5
130 PRINT@400 +(X*2),X$
140 FOR Y=1 TO
00:NEXT Y
150 CLS:NEXT X
160 PRINT@410,"FOOT!"
170 FOR X=1 TO 800:NEXT X
180 CLS: FOR X=1 TO 800:NEXT X
190 END
```

Program Listing 10. "Get 'Em"

```
10 CLS:PRINT "CHICKENS"
20 PRINT "By Bill Grout"
30 GOSUB 8000
40 CLS:GOSUB 8000
50 PRINT:PRINT:PRINT                    Chickens"
60 FOR X=1 TO 100:NEXT X:PRINT"                    are":FOR X=1 TO 40
0:NEXT X
70 PRINT@ 217,"creeps"
80 GOSUB8000
90 FOR X=1 TO3
100 FOR Y=1 TO80:NEXT Y
110 PRINT@328,"          Blinky-eyed":FOR Z=1 TO 80:NEXTZ
111 IF X=3 GOTO121 ELSEPRINT@328,"                    "
120 NEXT X
121 FORX=1TO 600:NEXT X
130 CLS:FOR X=1 TO 400:NEXT X:PRINT@400," They wouldn't believe
it"
150 PRINT"                    even if you told them you"
155 PRINT"                        were frying"
160 FOR X=1 TO1200:NEXT X
170 PRINT"                        their mother"
180 FOR X=1 TO 1200: NEXT X
190 CLS:GOSUB8000
200 END
8000 FOR X=1 TO 900:NEXT X
8100 RETURN
```

Program Listing 11. "Chickens"

```
10 CLS
20 PRINT "TIME MAGAZINE ARTICLE"
30 PRINT "By Bill Grout"
40 FOR X=1 TO 800:NEXT X:CLS:FOR X=1 TO 800:NEXT X
50 PRINT:PRINT:PRINT
60 PRINT "The newest thing in the United States is:":PRINT:PRINT
:
70 FOR X=1 TO1000:NEXT X
80 PRINT"                    PET-SEX ."
90 FORX=1 TO 800:NEXT X: CLS
100 FOR Y=1 TO 15
110 PRINT@ 400,"H":PRINT@400+Y,"ooray!!"
120 NEXT Y
130 FOR X=1TO1000:NEXT X
140 CLS: FOR X=1 TO 1000:NEXT X
150 END
```

Program Listing 12. "Time Magazine Article"

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A description of how it really works

Mod II Random Access

Terry Kepner
P.O. Box 481
Peterborough, NH 03458

While writing programs for the Radio Shack Model II recently, I have developed a few migraine headaches and discovered some disquieting facts about its Basic and TRSDOS's Random Access (also called Direct Access) files interaction. The facts giving me these headaches deal with Field statements, buffers, and how TRSDOS and Basic mishandle these items.

When I began using the buffers Model II Basic uses to place and then retrieve information from the disk random-access files, I followed the instructions in the Tandy manual. These instructions explain how to use the Field statement to tell Basic how to divide the buffer into separate fields of information, and determine how many different items are in the buffer, as well as how many bytes are in each of these items through the RSET and LSET commands. Once Basic is told how to divide the buffer, you can put data into it or remove data from it.

When you have filled the buffer, transfer the data to the disk file. To use that information later, Get a sector (256 bytes of data) and Basic will place it into the buffer. You can change the Fielding of the buffer as often as you want; however, to divide the buffer and recover your information, you must use the same Field arrangements (not necessarily the same Field statement) you used when you Put that information on disk in the first place.

Fielding Buffers

I was storing a rather large inventory of items on disk, arranged by product number, name, price and a set of eight numbers, some single precision and some double precision. At this point I was loading the file with only the product names and their respective numbers. Rather than manipulate the numbers, I ignored them and Fielded only the portions of the buffer needed. When I read this file back into memory to verify the program and my data were correct I discovered errors.

Even though I had not initialized the prices or quantities to any values, the files contained outrageous numbers, seven and 16 digits in length, with incredible exponents.

It took a few minutes to trace the problem. When Basic assigns a space in memory to be a buffer, it does not set the buffer to zero, but leaves the memory unchanged. This means the buffer contains garbage, usually alternating sets of 00 and FF.

Fielding a buffer assigns a variable name to a number of contiguous bytes in the buffer. When information is Set in this buffer, only the Field names used in the LSET or RSET commands are affected. If you Field a 256 byte buffer into four 64-byte chunks with the variable names A$, B$, C$, and D$, and put information into A$, then B$, C$, and D$ remain unaffected. When you transfer the data in this buffer onto the disk, all four chunks are written. If you put data into B$ without clearing the buffer, the next time you transfer this buffer to the disk the information in A$ will be written to disk again. Unless you are writing to the same sector as before you will have problems with your data.

> *"Fielding a buffer assigns a variable name to a number of contiguous bytes in the buffer."*

When you Set new data into A$, it replaces the information already there. Likewise, when you Get a sector of information from the disk and place it into the buffer it replaces the data there. Altering the buffer when Getting a new buffer of information or Setting data into specific portions of the buffer allows you to load a sector from the disk, make the necessary changes and put the information back on disk. A problem arises only when you perform a series of Put operations which involve changing parts of the buffer, such as when you build a mailing list, or use the buffer for the first time after initializing Basic.

In these cases remember to set the buffer equal to nothing—(CHR$(0)). Use blanks (CHR$(32)) only if you are not using numbers—in the buffer: blanks are interpreted as numbers and not

as zeros, CHR$(0) is interpreted as the number zero for integer, single precision, and double precision numbers.

Discovering that I had to set the buffer to nothing led directly to my next headache and the next problem.

According to the Model II manual the variable names in the Field statement are called Field names, and the manual explains: "*Most string variables point to an area in memory called the string space. This is where the value of the string is stored. Field names, on the other hand, point to the buffer area assigned in the Field statement.*"

Since the buffer contains 256 bytes and Field names in the Field statement identify buffer space and not string variables elsewhere in memory, it seems logical to Set a buffer equal to 256 bytes of any character, for example, CHR$(0).

This is not so, however; you must use two or more Field names to cover the entire buffer, such as:

```
FIELD #1, 255 AS D1$, 1 AS D2$
LSET D1$ = STRING$(255,CHR$(0))
LSET D2$ = CHR$(0)
```

Another Problem

I wanted an indication as to when I had reached an empty record in the file. I checked to see if D1$ = " " (the null set, nothing). I found 255 bytes of nothing (length of D1$, according to the function LEN(D1$), was zero) was *not* equal to the null set: Surprise!

I tested to see if D1$ was equal to CHR$(0); this worked.

My program lists a series of sectors to the video as an array. This array is spread over five sectors, and contains 19 elements. The first 64 bytes of the first sector is a general information area, and not part of the array. The second, third and fourth 64-byte chunks of the first sector are array elements one, two, and three. The remaining four sectors are divided into four chunks of 64 bytes each and comprise the other 16 elements of the array.

To save time I stored the number of active elements as a piece of data in the general area of the first sector. Only the necessary sectors are read when listing to the video. This is a real time saver when the last 17 elements are all blanks.

Several places require the array be listed to the video, so I made the listing routine into a general purpose subroutine. Without specifically setting a flag and testing for it, I did not know how many elements had been listed to the video after returning from that subroutine. My program simply returned to sector 1 each time the subroutine was executed.

That was where the problem came up. Whenever I returned from the listing routine, I set the buffer equal to zero to eliminate the possibility of contaminating my data and reloaded the buffer with sector 1.

As long as I had four or more entries from my array listed on the video, my update routine worked well. If less than four were listed to the video, not only did it not update as I wanted, but the routine erased much of the information in the first sector. I traced the problem—TRSDOS and Basic will not let you Get the same sector consecutively.

If you Get sector 1, use the data and decide to set the buffer to zero (or blanks), and then try to Get sector 1 again, it will not work! To save processing time, TRSDOS intercepts the Get command and won't return you to the same sector twice. You are left with a buffer of spoiled data you cannot replace unless you load the buffer with dummy information and then return to the sector you want and load it on top of the unneeded data. You end up using twice as much processing time as intended, not to mention the extra coding necessary to determine if you have to use this dummy load technique to get your data into the buffer.

I have not had any further troubles with this null set complication. With this article as a guide, you shouldn't have any problems either. ■

Terry Kepner is a free lance programmer and writer. He writes a column in Programmer *called "Overbyte" and a column in* 80 Micro *called "Feedback Loop."*

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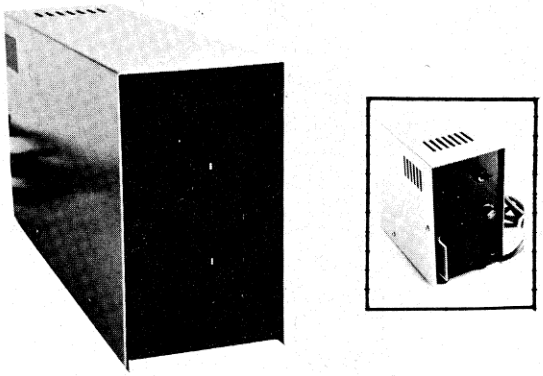

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Radio Shack's disks for the Color Computer cost $599. You get a ROM pack, a 35 track double density disk drive, a two-drive cable, a reasonably well-written manual and a free (?) disk.

The ROM pack is about 6¼″ by 4¼″ and slips into the ROM cartridge slot on the right of the computer (where the games go). The disk cable connects to the end of the pack and runs to the drive(s).

Inside the ROM pack (see Fig. 1) is a printed circuit board approximately 5″ by 3⅞″. The screw to the ROM pack is concealed beneath the label just after the period in "CAT NO." You will discover a ROM for the entire disk operating system (*nothing* resides on the disk at all) a double density disk controller, a few pots (which you probably should not touch), a crystal and some auxiliary circuitry.

The disk drive is 35 track double density. Imagine our surprise when we discovered that this Color Computer mini disk also worked fine on our Model I computers. Not only that, but our Model I disk drives worked fine on the Color Computer—and double density at that! Wow! This raises an interesting question: Will Radio Shack ever start selling the ROM pack by itself for those of us who already own disk drives? Apparently they do not at the present time.

The system is shipped with a two-drive cable, but it can handle four. The four-drive cables are available from the Shack.

The manual is well put together. It covers setting up the disk system, general description of how programs/files are stored on a disk, interacting with the disk, sequential files, direct access (random) files and some technical information.

Each of the 35 tracks on the disk is divided into 18 sectors of 256 bytes. The system assigns disk space in granules—blocks of nine sectors (half a track). Therefore each granule contains 2,304 bytes, each track 4,608 bytes and the entire disk contains 161,280 bytes. The user available disk space (excluding the directory) consists of 156,672 bytes. If Radio Shack had given us 40 track double density drives, we would have had 179,712 bytes. And if they had given us 80 tracks...

Unlike the Models I and III, the Color Disk system does not have a DOS (Disk Operating System) mode. You are always in Disk Basic. The operating system uses about 2K of RAM leaving a 16K system with 6439 bytes and a 32K system with 22823. If you will not be using any high resolution graphics, you can do "PMODE0,1: PCLEAR1" and have 11047 (16K) or 27431 (32K).

The lack of a DOS mode poses some inconveniences. You cannot list data files and you cannot run a particular program automatically. A partial solution to the former problem is our program Colorzap included in this article. There seems to be no software solution to the latter problem.

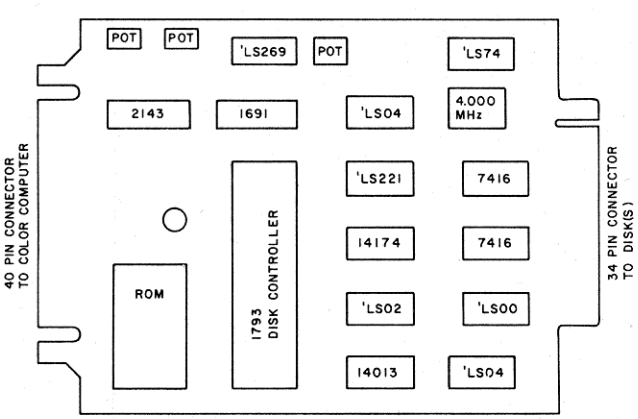

Fig. 1. Color Computer ROM Pack

System Software

The system software on the ROM pack consists of DSKINI, Backup and Copy. The phrasing of these commands is:

```
DSKINI drive number
BACKUP source drive (TO destination drive)
COPY file name-1 TO file name-2
```

DSKINI is the equivalent of Format on the Model I. For instance, DSKINI0 formats the disk in drive zero (in about 40 seconds).

You can back up a disk on a single drive or from one drive to another. A back-up with a single drive 32K system requires six disk swaps.

Copy, as the name implies, copies a file. For example:

```
COPY "COLORZAP/BAS" TO "COLORZIP/BAS"
COPY "COLORZAP/BAS:0" TO "COLORZAP/BAS:1"
```

Incidentally, as the manual indicates, *all* files *must* have an extension. The system assigns default extensions of BAS to Basic programs, BIN to machine-language software and DAT to data files. You may use your own extensions instead. If you saved a Basic program as COLORZAP, it would appear in the directory as COLORZAP BAS. (Note that the slash does not explicitly appear in the directory. You may use either a slash or a period as the extension separator.) You could run or load the program as just COLORZAP. However, when copying the program, be sure to specify the extension in both the source file name and the destination file name because the Copy utility will not assign them for you. As an example, suppose we had COLORZAP/BAS in the directory. COPY "COLORZAP" TO "COLORZIP/BAS" would produce an NE (no such file in directory) error. We forgot the extension in the source file name. COPY "COLORZAP/BAS" TO "COLORZIP" would work just fine. Unfortunately, LOAD "COLORZIP" will not work since it does not have an extension on the disk. We omitted the extension during Copy. You could retrieve it with LOAD

The Key Box

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Interactive Disk Commands

I will now describe those commands you use to interact with the disk drive(s). If you are familiar with other systems you will recognize these to be a mixture of DOS and Basic commands. However, in the Color Computer environment, these are all Basic commands. Most, if not all, can be used within Basic programs to add zip to your software which was not always possible with the Model I. For instance, you can display the directory, ask for the amount of free space, rename a data file, and so on.

Many of these commands are fairly similar to their Model I and III counterparts. However, there are some specific differences.

The command Drive followed by a drive number allows you to change the default drive the system uses—provided that you have more than one drive. The drives are numbered from 0 to 3 (maximum). Under normal circumstances, the computer will look at drive 0 (the default drive) when loading, saving, and so on. By using the Drive command, you can specify that the system use a different drive. It is important to note that the Color Disk system looks at only one drive. For instance, in a multi-drive Model I system, if you request LOAD "COLORZAP", the computer will look through all of the drives starting with drive 0 until it finds the program. This is not true with the Color system. If it does not find it on the default drive, it is not there! (Unless you include a drive number with the file name.)

The command Save followed by a file name ,A saves the program in memory to the disk using the file name given. Remember that if your file name does not contain an extension, the computer will assign /BAS. Note that the file name can include a drive number. For instance, SAVE "COLORZAP" would save the program in memory as COLORZAP/BAS on the default drive, whereas SAVE "COLORZAP/V15:1" would save it as COLORZAP/V15 on drive number one.

The optional ",A" appendage will save the program in ASCII format. This is necessary if you intend to merge the program with another program later.

You load a program with the command Load followed by a file name ,R. Remember to include the drive number in the file name if the program you want is not on the default drive (normally drive 0). The optional ",R" appendage will run the program after it has been loaded into memory. In addition, any files which were open before you issued this command will remain open.

The command Run followed by a file name ,R loads and runs the given file name from the disk. The optional ",R" leaves open files open as above. You need not specify the extension when loading or running unless you assigned an extension other than /BAS. In other words, even though the program is saved to disk as COLORZAP/BAS, you can LOAD "COLORZAP" or RUN "COLORZAP" without the extension.

You cannot load or run a string. If you let A$ = "COLORZAP", you cannot then RUN A$.

When you want to save machine language programs presently held in memory, use the command SAVEM followed by a file name, first address, last address and execution address. As indicated, you must supply the first, last and execution addresses for the program. If you do not specify an extension in the file name, the computer will assign /BIN for binary.

The command LOADM followed by a file name, offset address loads the machine language program from disk. You would then run the program by typing EXEC to execute it. If you specify the optional offset address, the computer will locate it at the original first address plus the offset address. The program must be relocatable if it is going to be able to function at this new location.

The default in the Color system is VERIFY OFF, whereas in the Model I the default is ON. Verify double-checks all writes to the disk. This provides greater reliability, but it takes about twice as long. Unless you are experiencing problems with loading files, you probably do not need VERIFY ON.

DIR lists the directory for the disk (default drive.) To see the directory on a specific drive, include the drive number appendage. A sample directory is shown below:

```
COLORZAP  BAS  0  B  2
MENU      BAS  0  A  2
DRAGON    DAT  1  A  1
VIDEOTEX  BIN  2  B  1
```

The first eight characters are the file name. Then there is a space followed by the extension. (As mentioned above, the slash or period before the extension is not indicated on the disk itself.) There are then three columns of information.

The first column shows the file type.

0—Basic program
1—data file
2—machine-language program
3—editor/assembler source program

The next column indicates the storage format of the file:

A—ASCII
B—Binary

And the last column shows the number of granules assigned to the file.

There are some problems with the directory. The directory keeps scrolling on the screen. In order to stop it, you have to press shift, @. A disk can contain up to 68 files, so on a really

Keywords (8183)	Tokens (Hex)	Addresses (81F0)
DEL	B5	8970
EDIT	B6	8533
TRON	B7	86A7
TROFF	B8	86A8
DEF	B9	8871
LET	BA	AF89
LINE	BB	93BB
PCLS	BC	9532
PSET	BD	9361
PRESET	BE	9365
SCREEN	BF	9670
PCLEAR	C0	968B
COLOR	C1	9546
CIRCLE	C2	9E9D
PAINT	C3	98EC
GET	C4	9755
PUT	C5	9758
DRAW	C6	9CB6
PCOPY	C7	9723
PMODE	C8	9621
PLAY	C9	9A22
DLOAD	CA	8C18
RENUM	CB	8A09
FN	CC	----
USING	CD	----

Notes:
1) DLOAD and DLOADM are commands which download programs to the Color Computer via the RS-232 port. They are not supported and apparently do not work.
2) FN and USING are stored as tokens but there are no execute addresses in the table.

Table 1. Extended Basic Keywords

Function Name (831E)	Token	Location (8257)
ATN	FF94	83B0
COS	FF95	8378
TAN	FF96	8381
EXP	FF97	84F2
FIX	FF98	8524
LOG	FF99	8446
POS	FF9A	86AC
SQR	FF9B	8480
HEX$	FF9C	8BDD
VARPTR	FF9D	86BE
INSTR	FF9E	877E
TIMER	FF9F	8968
PPOINT	FFA0	9339
STRING$	FFA1	874E

Table 2. Extended Basic Functions

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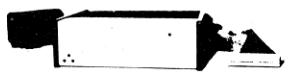
#TS-2BIII for NEWDOS V2 $99 (MOD III)



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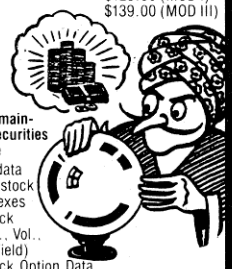

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full disk, you may have to list the directory several times before locating the file you want. Sixty-eight files is the equivalent of five screens zipping by at a good clip. Even speed readers will experience problems. At three in the morning, virtually all programmers will experience problems reading the directory. Radio Shack should have included a stop-between-screenfuls feature.

A reasonable solution to this problem is our Menu program included with this article. It closes up the spacing between the file name and the extension and includes the slash. We have eliminated three columns of information. Programs are sorted alphabetically. We eliminated scrolling and you can even run a Basic program from the menu.

The Free function requires the drive number. Free by itself is considered a syntax error. PRINT FREE(0) will display the number of free granules on drive 0. Unlike the Model I, the Free command works on only one drive at a time. It does not indicate the free space on all the drives, only the drive you request. Note that this is a function, not a command! You can state:

```
X = FREE(0)
P = SQR(FREE(0))
```

and so on.

The command Kill followed by a file name removes the file from the directory and frees up the space which had been assigned to it. You must include the extension when killing a file from the disk. KILL "COLORZAP" would not work—KILL "COLORZAP/BAS" would.

The command Rename followed by old file name to new file name changes the name of a file in the directory. Be sure you include the extension in both the old file name and the new file name. It follows the rules pointed out in the Copy utility above.

The command Merge followed by a file name ,R merges the file from disk with the program currently in memory. You must have saved the file with the ",A" (ASCII) appendage. Any duplicate line numbers will be replaced by the ones from the merged file. If you include the optional ",R", the resulting program in memory will be run and any files open before the merge will remain open.

The manual suggests you type the command Unload followed by a drive number before removing a disk from the drive. It closes any files on the specified drive. The drive number is optional; if not included, the Unload will operate on the default drive.

Disk File Commands

The Color system allows the user both sequential and direct access (random) file formats. The Color system uses commands similar to the Models I and III. They are as follows.

The default values are two buffers (1 and 2) and a buffer size of 256 bytes. If you need a different number of buffers or a different buffer size, use the command Files followed by buffer number and buffer size. The buffer size seems to be the total amount of buffer space available, not the amount per buffer. There is also a File Control Block (FCB) of 281 bytes per buffer.

To open a data file for processing use the command Open followed by "mode", buffer number, file name and record length. The modes are:

"O" Output—Sequential output
"I" Input—Sequential input
"D" Direct—Random input and/or output

Next is the number of the buffer to be used.

Buffer -0—screen or keyboard
Seems to be opened and closed automatically by ordinary Prints and Inputs. User seems to have no control over this.
Buffer -1—tape recorder
Buffer -2—printer
Buffer 1-15—disk files

Then supply the file name and optionally the record length if using direct access files. You can have record lengths less than 256 or greater than 256 if desired. This eliminates the Model I random file hassle of having to calculate the starting positions of logical sub-records.

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The **Super "Color" Writer** is a FAST, machine code, full featured, character (screen) oriented word processing system for the TRS-80™ Color Computer and ANY printer. The video display is styled after a professional phosphor (green characters on black background) display for hours of use without eye fatigue (optional orange on black). The unique print WINDOW frees you from 32, 51 or 64 character lines FOREVER! This window can be moved anywhere in the text file, up, down, left or right to display the text as it will be printed without wasting paper. You can create or edit **Super "Color" Terminal** files, ASCII files, BASIC programs or Editor/Assembler source listings. It's simple enough for beginners with 4K and . . . for the professional writer with a 32K disk system and a lot to say, there's plenty of room to say it!

COMPARISON CHART	SUPER COLOR WRITER			THE COMPETITION		
System Size	4K	16K	32K	4K	16K	32K
TAPE: Text space	N/A	7K	23K	N/A	2K	18K
ROMPAK: Text space	2.5K	16K	31K	N/A	N/A	N/A
DISK: Text space	N/A	5.5K	21.5K	N/A	0.5K	16.5K
Right Justify		YES			NO	
Video Window		YES			NO	
Edit any ASCII File		YES			NO	
Programmable Function		YES			NO	

The figures speak for themselves and with professional features like PROGRAMMABLE function string commands to perform up to 28 commands automatically. PROGRAMMABLE text file chaining, PROGRAMMABLE column insert & delete, and right hand JUSTIFICATION with punctuation precedence, the choice is clear but there's still more! In their September '82 issue, "80 MICRO" says, "The Color Computer has finally come of age. Nothing illustrates that coming of age better than this offering (SUPER "COLOR" WRITER) by Nelson Software". The **Super "Color" Writer** takes full advantage of the new breed of "smart printers" with Control codes 1-31, 20 Programmable control codes 0-255 for special needs. Works perfectly with all Epson, Radio Shack, Okidata, NEC, IDS, Centronics, Citoh, Smith Corona, Diablo Etc., Matrix, or Letter Quality Printers.

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COPY-NOT is an external security program for "BASIC" software authors. It is a menu-driven tutorial program that comes with a 41 page owners manual and technical support registration card. **COPY-NOT** significantly modifies TRSDOS 2.3 by killing off three TRSDOS modules thus achieving a net disk overhead of less than 2565 bytes. **COPY-NOT** stores all "/BAS" compressed files on the disk in encrypted form. **COPY-NOT** significantly modifies "DOS READY" function, but still allows library command execution. It's "DO/JCL" file allows up to nine DOS sequence commands. It has no impact on available memory during execution, and renders "BASIC★" equal to "GARBAGE". Furthermore, it allows the software author to place his 128 character title line on each diskette and has an AUTO serial number feature that places your 10 digit serial number on each application program diskette, and increments the serial number by one. It even has a simultaneous manufacturing feature that allows you to make up to three application programs at once. **COPY-NOT** error checks during execution and forces frustrated pirates into the assembly language code.

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CODE4

CODE4 is an internal security encryption program that is undecryptable by a micro-computer with its 1.6×10^{19} keys. CODE4 is a MICROSOFT COMPILED BRUN utility program that handles ASCII files with FIELD lengths of 256 characters or less. Generally, the file must not be longer than 29,140 bytes or 300 lines. CODE4 will handle small SCRIPSIT/UC REV01 compressed files of 10 pages or so. CODE4 comes with its list source which will allow easy customizing of its RANDOM NUMBER GENERATOR by selecting a prime number between 11 and 999991. CODE4 can be used with multiple keys. If time would allow 25 master keys of 1.6×10^{19} each, (2.56×10^{44}) keys then CODE4 would give the CRAY an undecryptable problem. There are no file protects so CODE4 disks can be backed-up, but if you don't know the pass number (EX. 125125,125125,3, 200,255), bulk erase and start over, you have just lost the file. The program is MENU driven and features five run modules: ENCODE, DECODE, SAVE FILE, ZERO FILE, and RETURN TO DOS. Like its big brother COPY-NOT, CODE4 is for use on a 48K, two-disk Model I system. It is available on a single density TRSDOS 2.3 disk, and comes with a sample ASCII file, and start up INSTRUCTIONS.

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The command Close followed by a buffer number closes the files specified. Close by itself closes all open files.

The command Write followed by a buffer number and your data list writes the data list to the specified buffer. Write does not directly place the data onto the disk. In the case of sequential files, the information in the buffer is placed on the disk either when the buffer is full or when you close the buffer. With direct access files, you place the information on the disk by the Put statement following the Write.

The command Print followed by a buffer number and data list is similar to the Write command but avoid it unless you know exactly what you are doing. This is the old Model I way of putting information onto the disk. It requires the user to specify explicitly the commas, semicolons and quotation marks. The problems inherent in using this command probably kept most Model I users from ever attempting random access files.

Print followed by a buffer number, Using format and data list is another leftover command from the Model I that you want to avoid unless you have very peculiar needs! Print and Print Using can be very useful for particular file requirements. The problem is that you definitely have to understand how the information is stored physically on the disk. If you want to experiment with these commands, we urge you to use our COLORZAP program so that you examine what was actually put on the disk.

The command Input followed by a buffer number and variable name loads data from the specific buffer. The command Line Input followed by a buffer number and your data loads an entire block of data from the specific buffer until it encounters the first <ENTER> (0D hex).

Other Functions

Use the EOF (buffer) function to detect if you have reached the end of the file. Use the LOC (buffer) function to determine the correct record number. Use the LOF (buffer) function to determine the last record number in the file.

Use the function Field followed by a buffer number and field size as field name with direct access files to format the buffer. Use the function Get followed by a buffer number and record number with direct ac-

Program Listing 1

```
10 REM      COLORZAP
20 REM     BOB NICHOLAS
30 REM      10/22/81
40 REM
50 CLS:CLEAR500: DIM M$(1),A$(16),K(22):BL$=CHR$(128):BL=159
60 FORX=1 TO 16:READ A$(X):NEXT
70 DATA D,#,0," ",T,#,,," ",S,#,,," "," "," "
80 FORX=1TO22:READK(X):NEXT
90 DATA 8,9,10,12,13,48,49,50,51,52,53,54,55,56,57,65,66,67,68,6
9,70,94
100 CLS:INPUT"HOW MANY DRIVES DO YOU HAVE";MD:MD=INT(MD-1):IFMD<
0ORMD>3 THEN GOTO100
110 CLS
120 CLS:IFMD=0 THEN DN=0:GOTO150
130 PRINT@320,"":PRINT@320,"DRIVE #";:INPUTDN:DN=INT(DN):IFDN<0
OR DN>MD THEN GOTO 130
140 A$(3)=STR$(DN):A$(3)=RIGHT$(A$(3),1)
150 PRINT@352,"":PRINT@352,"TRACK # (0 - 34)";:INPUT TN:TN=INT(T
N):IFTN<0 OR TN>34 THEN GOTO150
160 PRINT@384,"":PRINT@384,"SECTOR # (1 - 18)";:INPUT SN:SN=INT(
SN):IFSN<1 OR SN>18 THEN GOTO 160
170 MN=0
180 REM     MAIN ROUTINE
190 CLS:DSKI$ DN,TN,SN,M$(0),M$(1)
200 A$(7)=STR$(INT(TN/10)):A$(8)=STR$(TN-10*INT(TN/10))
210 A$(7)=RIGHT$(A$(7),1):A$(8)=RIGHT$(A$(8),1)
220 A$(12)=STR$(INT(SN/10)):A$(13)=STR$(SN-10*(INT(SN/19)))
230 A$(12)=RIGHT$(A$(12),1):A$(13)=RIGHT$(A$(13),1)
240 GOSUB410
250 IN$=""
260 IN$=INKEY$:IFIN$=""THEN260
270 IF IN$="M" THEN GOSUB 610: GOTO190
280 IN=ASC(IN$)
290 IFIN=9 THEN360
300 IFIN=12 THEN GOTO120
310 IFIN <> 8 THEN GOTO260
320 IF MN=1 THEN MN=0: CLS: GOTO240
330 SN=SN-1:IFSN<1 THEN SN=18:TN=TN-1
340 IFTN<0THENTN=0:SN=1:MN=0:GOTO250
350 MN=1:GOTO190
360 IF MN=0 THEN MN=1:CLS: GOTO240
370 SN=SN+1:IFSN>18 THENSN=1:TN=TN+1
380 IFTN>34 THENTN=34:SN=18:MN=1:GOTO250
390 MN=0:GOTO190
```

Listing 1 continues

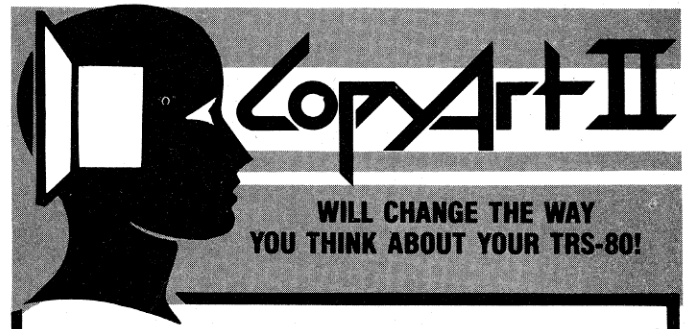
Listing 1 continued

```
400 REM    PRINT FORMAT
410 FORZ=1TO128 STEP 8
420 L$=HEX$(Z+MN*128-1):IFLEN(L$)<2 THEN L$="0"+L$
430 PRINT@32*(Z-1)/8,A$(1+(Z-1)/8);L$;BL$;
440 FORQ=0TO7 STEP2
450 H1$=HEX$(ASC(MID$(M$(MN),Z+Q,1))): H2$=HEX$(ASC(MID$(M$(MN),
Z+Q+1)))
460 IFLEN(H1$)<2 THEN H1$="0"+H1$
470 IFLEN(H2$)<2 THENH2$="0"+H2$
480 PRINTH1$;H2$;
490 IF Q=6 THEN PRINTBL$; ELSEPRINT" ";
500 NEXT Q
510 J=(Z-1)/8
520 FORQ=0TO7
530 PK=ASC(MID$(M$(MN),Z+Q,1))
540 IF PK<32 THENPK=96:GOTO570
550 IFPK >=32 AND PK<=63 THEN PK=PK+64:GOTO570
560 IFPK>=96 AND PK<=127 THENPK=PK-96
570 POKE1048+J*32+Q,PK
580 NEXT Q
590 NEXT:RETURN
600 REM     MODIFY MODE
610 SP=1:CU=1028:CM=0:MM$=""
620 CU=1028 +32*INT((SP-1)/8) + +CM +INT(CM/4)
630 PE=PEEK(CU)
650 POKECU,BL:MM$=INKEY$:POKECU,PE:IFMM$=""THEN650 ELSEMM=ASC(MM
$)
660 FL=0:FORZ=1TO22:IFMM=K(Z)THENFL=Z
670 NEXTZ:IFFL=0THEN650
680 ON FL GOTO 700,730,760,780,800,870,870,870,870,870,870,870,8
70,870,870,870,870,870,870,870,870,870,1090
690 REM   BACK ARROW
700 CM=CM-1:IFCM>=0 THEN SP=SP+(INT(CM/2)<>CM/2):GOTO620
710 CM=0:IFSP>8 THEN SP=SP-1: CM=15:GOTO620 ELSE GOTO 650
720 REM   FORWARD ARROW
730 CM=CM+1:IFCM<=15 THEN SP=SP-(INT(CM/2)=CM/2): GOTO 620
740 CM=15:IFSP<121 THEN SP=SP+1:CM=0:GOTO620 ELSE GOTO650
750 REM   DOWN ARROW
760 IF SP<121 THEN SP=SP+8:GOTO620 ELSE GOTO 650
770 REM    CLEAR
780 GOTO 190
790 REM   MODIFY DISK MEMORY
800 CLS:PRINT"PRESS <X> TO CANCEL MODIFICATIONOR PRESS <ENTER> T
O MODIFY DISK CONTENTS AS INDICATED."
810 VM$=INKEY$:IFVM$=""THEN810
820 IFVM$="X" THENGOTO 190
830 IFASC(VM$)<>13 THEN GOTO 810
840 DSKO$ DN,TN,SN,M$(0),M$(1)
850 GOTO190
860 REM   MODIFYING HEX VALUE
870 PZ=K(FL):IFPZ<65 THENPZ=PZ+64
880 POKECU,PZ
890 V(0)=0:V(1)=0:VL=0
900 IFINT(CM/2)=CM/2 THEN GOTO 970
910 V(1)=FL-6
920 PN=PEEK(CU-1)
930 IFPN>=112 THENPN=PN-112:GOTO960
940 IFPN>=65THENPN=PN-55:GOTO960
950 IF PN>=48 THENPN=PN-48
960 VL=PN*16+V(1):GOTO1020
970 V(0)=FL-6:PN=PEEK(CU+1)
980 IFPN>=112 THENPN=PN-112:GOTO1010
990 IF PN>=65 THEN PN=PN-55:GOTO1010
1000 IFPN>=48 THENPN=PN-48
1010 VL=V(0)*16+PN
1020 MID$(M$(MN),SP,1)=CHR$(VL)
1030 IFVL<32 THEN VL=96:GOTO1060
1040 IFVL>=32 AND VL<=63 THEN VL=VL+64:GOTO1060
1050 IF VL>=96 AND VL<=127 THEN VL=VL-96
1060 SV=INT((SP-1)/8):POKE1047+32*SV+SP-8*SV,VL
1070 GOTO730
1080 REM   UP ARROW
1090 IF SP >8 THEN SP=SP-8:GOTO620 ELSE GOTO650
```

Keyword (C17F)	Token	Location (C1DB)
DIR	CE	CBCF
DRIVE	CF	CDE9
FIELD	D0	CFE0
FILES	D1	D080
KILL	D2	C6C2
LOAD	D3	C99A
LSET	D4	D026
MERGE	D5	C98B
RENAME	D6	CF3F
RSET	D7	D025
SAVE	D8	C932
WRITE	D9	CF8A
VERIFY	DA	D65B
UNLOAD	DB	D146
DSKINI	DC	D4AB
BACKUP	DD	D175
COPY	DE	D2CC
DISKI$	DF	D3FF
DISKO$	E0	D474
LOADM		CEE5
SAVEM		CE8C

The last two items are not in the table of names or the table of addresses. They are stored as the token for Load (or Save) followed by 4D (M). The addresses were found by examining the beginning of the Load (and Save) code.

Table 3. Disk Basic Keywords



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cess files to get the specified record from the disk and place it into the specified buffer. Use the function Put followed by a buffer number and record number with direct access files to place the data in the specified buffer into the specified record on the disk. Use the function LSET field name = data mainly with direct access files. It left justifies the data within the field named. RSET field name = data does what LSET does but right justifies.

MKN$(number) converts a number to a string for file storage. Use it for direct access files.

CVN(string variable) converts the string created above back into a number.

Brand New Basic Commands

Radio Shack has included two brand spanking new disk commands in the Color system. These commands allow you to examine or modify any sector of any track on any disk—easily! Their formats are:

DSKI$ drive number,track,sector,string1, string2
DSKO$ drive number,track,sector,string1, string2

DSKI$ is for input and DSKO$ is for output. DSKI$ takes the information from the specified sector/track/drive and places the first 128 bytes into string1 and the last 128 bytes into string2. Tracks are numbered 0–34 and sectors within tracks are numbered 1–18. For instance DSKI$0,17,3,A$,B$ would read the first sector of file names from the directory (track 17). All you do is PRINTA$;B$ and you see it!

To use DSKO$, you must set up the values of A$ and B$ with 128 bytes in each. They will then be written to the specified sector/track/drive. Be very sure you know what you are doing when using this command. You could destroy the contents of the disk if you misuse this command. As a guide, study our programs Menu and Colorzap which use both of these commands.

We are devoting much of the rest of this article to an explanation of what we have learned about the Color Computer and how and where it stores commands and data.

Four tables contain the keywords and functions in both Extended Basic and Disk Basic

Function (C201)	Token	Location (C214)
CVN	FFA2	CD1A
FREE	FFA3	CDC0
LOC	FFA4	CD36
LOF	FFA5	CD5B
MKN$	FFA6	CD28
AS	FFA7	----

The word AS is in the word table but has no execute address associated with it.

Table 4. Disk Basic functions

Granule numbers in hexadecimal, track and sector numbers in decimal.

G	T	S	G	T	S	G	T	S	G	T	S
00	00	01	11	08	10	22	18	01	33	26	10
01	00	10	12	09	01	23	18	10	34	27	01
02	01	01	13	09	10	24	19	01	35	27	10
03	01	10	14	10	01	25	19	10	36	28	01
04	02	01	15	10	10	26	20	01	37	28	10
05	02	10	16	11	01	27	20	10	38	29	01
06	03	01	17	11	10	28	21	01	39	29	10
07	03	10	18	12	01	29	21	10	3A	30	01
08	04	01	19	12	10	2A	22	01	3B	30	10
09	04	10	1A	13	01	2B	22	10	3C	31	01
0A	05	01	1B	13	10	2C	23	01	3D	31	10
0B	05	10	1C	14	01	2D	23	10	3E	32	01
0C	06	01	1D	14	10	2E	24	01	3F	32	10
0D	06	10	1E	15	01	2F	24	10	40	33	01
0E	07	01	1F	15	10	30	25	01	41	33	10
0F	07	10	20	16	01	31	25	10	42	34	01
10	08	01	21	16	10	32	26	01	43	34	10

Table 5. Granule Map for Use with Colorzap Program

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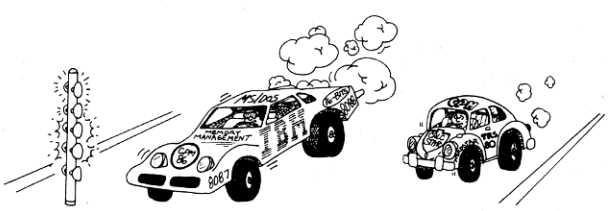

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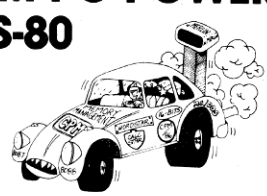

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along with their tokens and the locations for their code. A token is the compact way in which these Basics store the keywords, or commands. These tokens are ASCII codes between 129 and 250. The keyword "SCREEN", for example, is stored as BF (hexadecimal) or 191. This takes one byte of memory as opposed to six bytes if "SCREEN" were stored in its expanded, or ASCII, form.

When storing a command, Basic looks through the first column of the tables and determines what token should be stored. When executing a command, Basic takes the token and executes the code starting at the address specified in the third column. In each table at the start of the first and third columns there is a number. This number indicates where in the Color Computer's memory the table containing the keywords or addresses is located.

Table 1 lists Extended Basic keywords and Table 2 lists the locations of the Extended Basic functions. Table 3 shows Disk Basic keywords and Table 4 lists Disk Basic functions.

You may be able to call some of these routines from within your own programs—Basic or machine language. For instance, Table 1 indicates that the address of the RENUM command is 35337 (8A09 hex). You can renumber any program resident in memory with RENUM starting with line 10 in increments of 10. Or, try EXEC 35337 for the same result!

The Disk Directory

Using the program Colorzap, you can look through the disk and examine any track and sector you desire. You might want to start by looking at track 17 sector 3. This is the beginning of the directory. As indicated in the manual, an entry in the directory consists of the program name, left justified in bytes 0–7, then an extension in bytes 8–10 (see sample directory screen, Fig. 2). The rest of the bytes in the entry specify the file type, whether it is ASCII or not, the starting granule, and the number of bytes

Program Listing 2

```
10 GOTO 70
20 RUN"
30 REM     COLOR-MENU
40 REM    BOB NICHOLAS
50 REM     10/23/81
60 REM
70 CLS:CLEAR2000
80 DIM P$(72),A$(1),SP(24)
90 FORX=1TO12:SP(X)=X*32+32:SP(X+12)=SP(X)+16:NEXT
100 BL$=STRING$(32,175)
110 Z$=CHR$(191)
120 CLS:PRINT"MENU OPTIONS:"
130 PRINTBL$:NN=0:FORX=1TO72:P$(X)="":NEXT
140 PRINT"      1 - LIST DISK MENU"
150 PRINT"      2 - DISK NAME AND DATE"
160 PRINT@384,"":PRINT@384,"WHAT IS YOUR CHOICE";:INPUTCH:IFCH<1
 OR CH>2 THEN GOTO 160
170 ON CH GOTO 180, 760
180 CLS:INPUT"WHICH DRIVE";ND:ND=INT(ND):IFND<0 ORND>3 THEN CLS:
GOTO180
190 DSKI$ ND,17,18,A$,B$
200 DN$=MID$(B$,113,8)
210 DT$=MID$(B$,121,8)
220 ND$=STR$(ND):ND$=RIGHT$(ND$,1)
230 DN$=DN$+":"+ND$
240 FR=FREE(ND)
250 PN=1
260 GOSUB500
270 PRINT@64,"WHEN DIR. IS PRINTED, USE THE   RIGHT AND LEFT ARR
OW KEYS TO    SCROLL THRU THE LIST OF PROGRAMSON THE DISK. (<CLE
AR> FOR MENU)
280 GOSUB550
290 S=1
300 GOSUB500
310 FORT=0 TO 11
320 PRINTTAB(2); P$(S+T);TAB(18);P$(S+T+12)
330 NEXT T
340 PP=1
350 PRINT@SP(PP),Z$;:IN$=INKEY$:PRINT@SP(PP)," ";:IFIN$=""THEN35
0
360 IN=ASC(IN$):IF IN=12 THEN GOTO 120
370 IF IN=13 THENGOTO880
380 IF IN=10 THEN PP=PP+1
390 IFIN=94 THEN PP=PP-1
400 IF PP<1 THENPP=1
410 NV=INT((S-1)/24)
420 IFPP>(NN-24*NV) THEN PP=(NN-24*NV)
430 IF PP>24 THEN PP=24
440 IFIN=9THEN480
450 IFIN<>8 THENGOTO350
460 IFS-24<1 THEN GOTO350
```

Listing 2 continues

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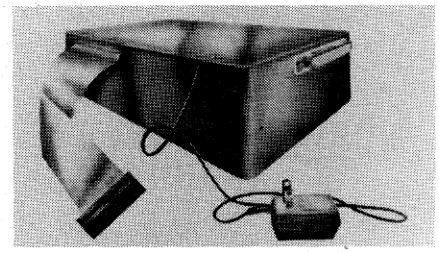

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Listing 2 continued

```
470 PP=1:S=S-24:GOTO300
480 IF S+24>49 ORS+24>NN THEN GOTO350
490 PP=1:S=S+24:GOTO300
500 CLS:PRINTDN$TAB(12);DT$TAB(21);FR"GRANS":PRINTBL$
510 PRINT@448,BL$;
520 IFNN>0 THEN PRINT@490,NN" PROGRAMS";
530 PRINT@64,"";:RETURN
540 REM   SCAN DIRECTORY
550 PRINT@232,"READING DIRECTORY":FORZ=3TO11
560 DSKI$ ND,17,Z,A$(0),A$(1)
570 FORQ=0TO1
580 FORW=0TO3
590 P$=MID$(A$(Q),W*32+1,32)
600 P1$=LEFT$(P$,1):P1=ASC(P1$):IFP1=0 THEN GOTO 660
610 IF P1=255 THENGOTO680
620 NN=NN+1:P$(NN)=LEFT$(P$,8)
630 IFRIGHT$(P$(NN),1)=" "THENP$(NN)=LEFT$(P$(NN),LEN(P$(NN))-1)
:GOTO630
640 P$(NN)=P$(NN)+"/"+MID$(P$,9,3)
650 IF RIGHT$(P$(NN),1)=" " THENP$(NN)=LEFT$(P$(NN),LEN(P$(NN))-
1):GOTO650
660 NEXTW,Q,Z
670 REM   SORT ROUTINE
680 PRINT@228,"SORTING THE"NN"PROGRAMS"
690 M=NN
700 M=INT(M/2):IFM=0 THENRETURN ELSE PRINT@302,M;
710 J=1:K=NN-M
720 I=J
730 L=I+M:IFP$(I)<=P$(L) THEN750 ELSE T$=P$(I):P$(I)=P$(L):P$(L)
=T$:I=I-M
740 IFI<1 THEN750 ELSE730
750 J=J+1:IFJ>K THEN700 ELSE720
760 CLS:INPUT"NAME OF DISK (MAX = 8)          ";DN$:IFDN$="" THEN
 GOTO760
770 DN$=LEFT$(DN$,8)
780 INPUT"ENTER DATE (MM/DD/YY)";DT$:IFLEN(DT$)<8 THEN CLS:GOTO7
80
790 IFLEN(DT$)>8 THEN CLS: GOTO780
800 INPUT"DRIVE #";DN:DN=INT(DN):IFDN<0 OR DN>3 THEN CLS: GOTO80
0
810 DSKI$ DN,17,18,A$,B$
820 MID$(B$,113,16)=STRING$(16,32)
830 MID$(B$,113,8)=DN$
840 MID$(B$,121,8)=DT$
850 DSKO$ DN,17,18,A$,B$
860 GOTO120
870 REM   POKE PROGRAM NAME INTO          SECOND LINE TO BE RUN
880 PN=PP-1+S
890 P$=P$(PN)+":"+ND$+CHR$(34)+":"
900 A=PEEK(25)*256+PEEK(26)
910 B=PEEK(A)*256+PEEK(A+1)+6
920 LE=LEN(P$)
930 FORQ=B TO LE+B-1
940 PE=ASC(MID$(P$,Q+1-B,1))
950 REM IF PE>=32 AND PE<=63 THEN PE=PE+64
960 POKEQ,PE
970 NEXT
980 GOTO 20
```

used in the last sector. When you kill a program or file, the first character of its name is reset to a space.

If you want to look at a particular program, look it up in the directory, and note the starting granule and number of bytes in the last granule. Then look at track 17 sector 2, the file allocation table. The byte in this sector which corresponds to the starting granule will have in it a granule number (00-43 hex) or a last granule marker (C0-C9 hex). If the byte is another granule, write it down and look up its position in the table.

Now you have a list of granules, a last granule marker, and the number of bytes in the last granule. The last granule marker indicates which sector (0-9) of the granule is the last one used, so you now have all the data needed to trace the program, except which tracks and sectors correspond to a given granule. This information is available in Table 5. For example, if you knew from the directory that the file you want started with granule "2C," Table 5 would inform you to look at track 23 sector 01.

Color Disk Storage

What will you see when you look at a file? If it is a binary format Basic file, the first byte will be FF and the next two bytes will be the program length in bytes. The program lines will be after this in binary format.

Program lines in binary format consist of a two-byte pointer to the next line, a two-byte line number, the program line with the keywords compressed into single-byte equivalents (see Tables 1-4) and a byte 00 to indicate end of line. Three 00 bytes in a row indicate end of program.

If the file is an ASCII format Basic file, it will start with a 0D (carriage return) and consist of the lines written out in full with carriage returns between them. Two 00 bytes occur at the end of the file.

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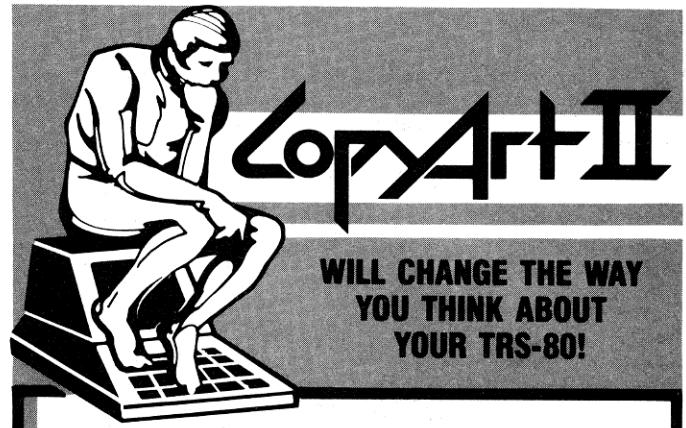

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If the file is a machine-language program, the first byte will be 00. The next two bytes specify the program's length. The following two bytes specify the beginning address. Next comes the program followed by the three-byte sequence FF0000. Finally there are two bytes for the starting address.

For data files the data you have saved will be stored on the disk depending upon the type of data (string or numeric) and the output format used (Write, Print or Print Using). The length of the file is determined from the information in the directory. The record length is not part of the file. This is why you are advised to stick to the normal Write format and not fool around with Print and Print Using.

```
D00 4D45 4E55 2020 2020 MENU
#08 4241 5300 0020 0019 BAS
010 0000 0000 0000 0000
 18 0000 0000 0000 0000
T20 434F 4C4F 525A 4150 COLORZAP
#28 4241 5300 0022 0090 BAS " *
130 0000 0000 0000 0000
738 0000 0000 0000 0000
 40 5041 4745 5220 2020 PAGER
S48 4241 5300 001E 008D BAS   *
#50 0000 0000 0000 0000
058 0000 0000 0000 0000
360 5654 4D4F 5645 2020 VTMOVE
 68 4241 5300 001F 00C5 BAS   *
 70 0000 0000 0000 0000
 78 0000 0000 0000 0000
```

Note that the asterisks (*) above indicate graphic blocks on the video screen.

Fig. 2. Sample Directory Listing from Colorzap

```
10 REM     PAGER
20 REM     PHIL MARTEL
30 CLS:INPUT"ENTER PAGE #";P
40 FORI=0 TO 6:IFP AND 2^I THENPOKE65479+2*I,0 ELSEPOKE65478+2*I
,0
50 NEXT
60 IN$=INKEY$:IFIN$=""THEN60
70 IN=ASC(IN$):IFIN=12THEN30ELSE60
```

Program Listing 3

Programs

Pager (16K tape or disk) is a very short routine (see Program Listing 1) which enables you to look through the lower 32K of memory. It will work with any configuration of the Color Computer. It displays on the screen any one of 64 ½K blocks of memory.

To display these blocks, Pager loads the display offset area of the Color Computer's 6883 SAM chip. In this display offset area (65478–65491) pairs of addresses correspond to the bits of a register which specify which one of the 64 blocks is displayed on the screen in text mode. One address clears a bit when anything is written to it; the next address sets the bit.

Page 0 is an interesting page to look at. Look at all the flashing characters! Now look at the big orange block (eleventh row) and press a key. Did you see the dark area appear? This area acts like a map of the keyboard. Press the clear key to request another page.

Use this program as a starting point. The computer can display a page while it is doing something else, so:

Look past the end of your program while it is running and watch the variables change; look at the top of memory and see how strings work; and watch page 0 while a program is running and try to see what some of those changing blocks mean.

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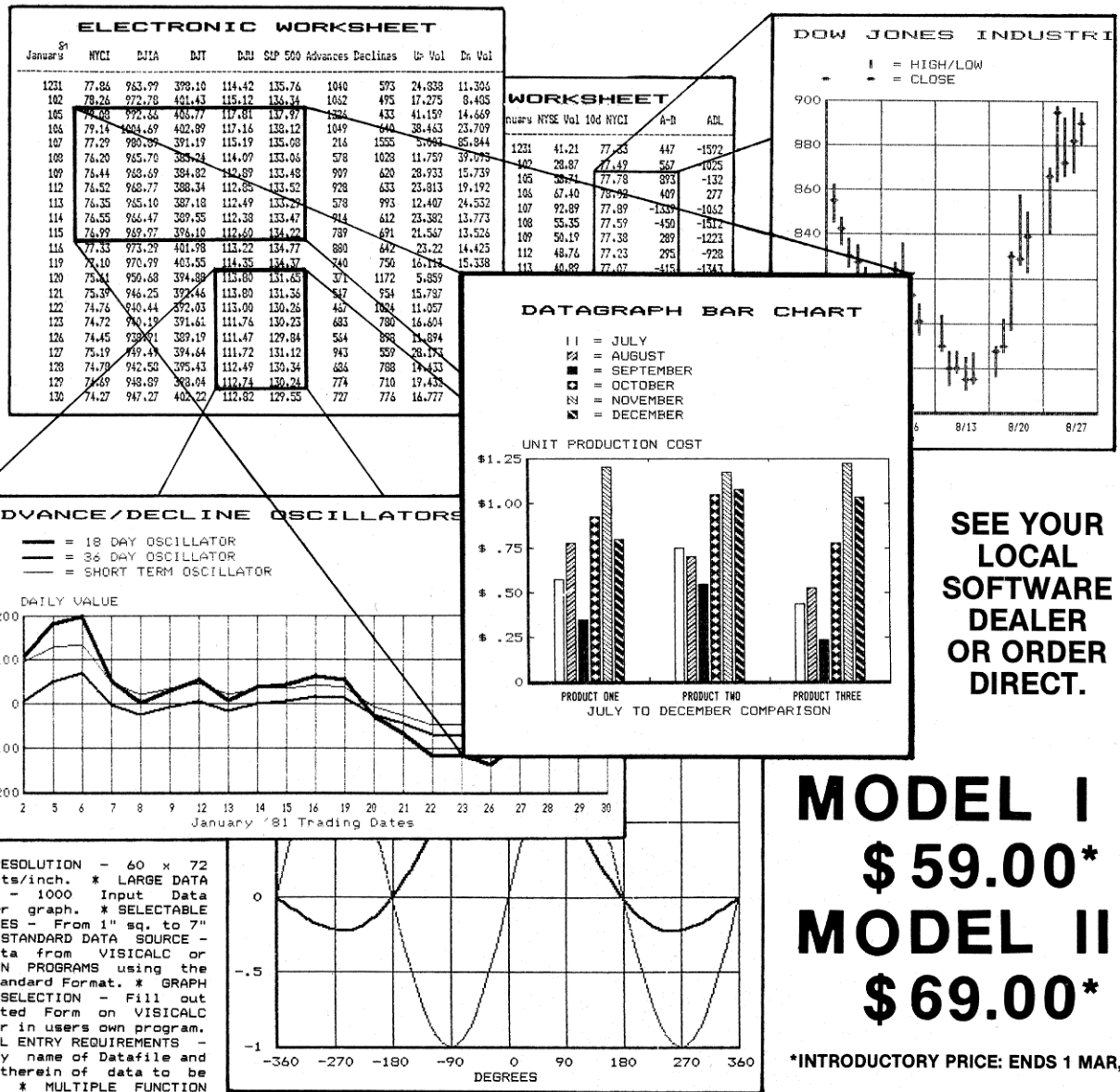

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value you specify (see Program Listing 2). Its heart is a short (22 byte) machine-language routine which gets POKEd just below the top of the first 16K of memory. RAMSET then asks for a value to use in filling memory.

All of RAM is filled with this value except 16370-16383 (3FF2-3FFF) and 32754-32767 (7FF3-7FFF) and then control returns to Basic.

Why do this? It is very useful if you are trying to find out where a piece of machine-language software resides. Run RAMSET, load the machine-language program, then load Pager. You will know you have found the program when the monotony of the pages you are stepping through suddenly changes.

Find the first byte of the program. Call the page number P and line that the byte appears on L and the column C. Then the beginning address is P*512 + L*32 + C – 1. You can find the ending address in a similar fashion. You can find the starting address by: Printing 256*PEEK(157) + PEEK(158). You can now use the SAVEM command to save "BLAST THE BEASTIES" onto disk.

However, the program will not necessarily run properly. The disk system reserves addresses 1536-2440 (0600-0988 hex) for its own use. This moves the high-resolution graphics screens up in memory. Any program which relies on the screen's starting at a particular address will not work properly. Any program which runs in the locations that the disk system uses will not run either.

The program VTMOVE (16K disk) takes the tape version of Radio Shack's Videotex terminal program and places it onto disk in such a way that you can run it using LOADM and EXEC (see Program Listing 3). Videotex normally starts at 1728 (06C0 hex). VTMOVE reads it in from tape starting at a location 1000 hex higher (that is the &H1000 after the CLOAD). VTMOVE then appends a 17-byte program which will move Videotex back down where it belongs and saves the program to disk automatically.

Menu (16K disk) will help you clean up the screen listing of the disk directory (see Program Listing 4). Unlike most other directories, the Color disk does not store a name for the disk or the date the disk was created. We find both of these to be rather useful features and have implemented them into Menu. Select option two in the program and supply the name (up to eight characters) and the date (MM/DD/YY). These will be stored in the last sixteen bytes

```
10 'ZERORAM PROGRAM
20 'BY PHIL MARTEL 1981
30 A=&H3FEB
40 READ D: IF D>=0 THEN POKE A,D:A=A+1: GOTO 40
50 DATA26,80,134,0,142,63,242,167,137,64,0,167,130,140,0,0,38,24
5,126,160,39,-1
60 INPUT"WHAT DO YOU WANT RAM LOADED WITH";D
70 POKE 16366,D
80 EXEC 16363
```

Program Listing 4

```
0 'PATCH FOR SAVING VIDEOTEX ON DISC
20 ' C.1981 BY PHIL MARTEL
30 CLS:PRINT "PUT YOUR VIDEOTEX TAPE INTO YOURCASSETTE. PRESS TH
E SPACE BAR TOREAD IN THE TAPE.
40 IF INKEY$<>" " THEN 40
50 CLOADM"VIDEOTEX",&H1000
100 A=&H1EF7
110 READ D: IFD>=0 THEN POKE A,D:A=A+1:GOTO110
120 DATA&H8E,6,&HC0,166,&H89,16,0,167,128,&H8C,14,&HF7,&H26,&HF5
,&H7E,6,&HC0
130 DATA-1
150 CLS:PRINT"PLACE YOUR DISC IN DRIVE 0 AND  HIT THE SPACEBAR
160 IF INKEY$<>" " THEN 160
170 SAVEM"VIDEOTEX",&H16C0,&H1F07,&H1EF7
```

Program Listing 5

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of track 17 sector 18 which is not used by the disk system at all.

Menu's main function shows you what is in the disk directory (option one). Indicate which drive you want to use. The computer will display the name and date of the disk, the number of free granules left, the number of files on the disk and an alphabetically sorted listing of the directory (see sample menu listing in Fig. 3). The listing will be shown in two columns with a maximum of 24 files per screenful. If the listing extends over more than one screenful, you can go back and forth through your directory using the right arrow for forward and the left arrow for backward.

In addition, you can move a flashing cursor in front of any file in the listing by using the up arrow or down arrow. Simply position the cursor before the Basic program you wish to run and press enter and Menu will load and run that program automatically. Note that only Basic programs can be run from Menu, not machine-language programs.

With Colorzap (32K disk) you can do a lot of things, some of which we have indicated earlier in this article. But be careful! There is no danger in examining the contents of your disk, but be sure you know what you are doing before you attempt to modify the contents of the disk.

The program will ask you how many drives you have attached to the computer (1–4). If you indicate that you only have one drive, you will no longer be asked to specify the drive you wish to examine; otherwise, indicate the drive number (0–?). You will then be asked to enter the track number (0–34) and the sector within that track (1–18) to be displayed.

Your disk will now fire up and the first 128 bytes of the drive/track/sector specified will be displayed (see sample screen in Fig. 2). The far left column (going down) indicates the drive number, track number and sector number. The next two columns show the relative byte within the sector for the start of that line of information. Then the next eight bytes of the sector are shown in hexadecimal in groups of twos. And finally, those eight bytes are shown in ASCII. (Note that ASCII values from 0 to 32 are all displayed as spaces.) You can scroll forward (right arrow) or backward (left arrow) through the disk contents. Pressing clear allows you to specify another disk/track/sector to display.

To alter your disk memory press M for modify. A flashing cursor will now appear over the hex portion of the screen. You can move this cursor around with the four arrow keys. To alter disk memory, type over old hex values with new hex values.

You have not changed anything on the disk. If you want to abort any alterations now, press clear. To accept the alterations indicated, press enter. You will have one last chance to leave the disk contents unmodified or to finally make the modifications. ■

DEVELOP :0 10/24/81 2 GRANS

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40PIANOS/BAS	JOY2/BAS
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CANVAS/DAT	MENU/BAS
COLORZAP/BAS	MUSIC/BAS
DATABASE/BAS	PAGER/BAS
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33 PROGRAMS

Fig. 3. Sample Directory Listing from Menu

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Screen Format Program Generator

by Joel Belcher

Save yourself the trouble of figuring screen locations, field prompts, and input fields, and let your computer do the work for you.

One of the most important factors of a program is the readability of the screen displays. Many fine programs have such complex screens that it takes several minutes to find the information you need. Laying out a screen display on a coding form and then counting the spaces to find the print @ position can take many hours, hours that could have been better spent.

I have a better way. Type the screen layout on your CRT and let your computer count the spaces for you. At the same time, why not let the computer pick up the field prompts and the input fields? If you have that much information, why not let your computer write the program for you? I'll show you just how easy it is to do.

Variable	Full Name	Description
F$( )	Fields	Array for disk buffer
EL$	Erase line	Prints 63 spaces and 63 backspaces
LR	Last record	Holds last record on file
RN	Record number	Holds current record number
YN$	Yes/No	Used in all prompts that require a yes/no answer
NE	New	Flag used to indicate a new record is being added
IC	Item to change	Holds number of item (field) to be changed
I	Input location	Holds location of input
IL	Input length	Holds length of input field
IN$	Input string	String used to hold inputs
PL	PEEK location	Holds video memory location of cursor
VB	Video byte	Byte from location PL
KB$	Keyboard string	String to hold input from INKEY$
KB	Keyboard	Holds ASC of KB$
W	Wait	Used in For...Next loop for delay
FNVM(P)	Video memory	PEEKs memory locations used by Basic to retrieve current cursor location
FNST$(T)	Strip	Strips leading blank from numbers

Table 1. Listing 1 Variables

The Program Generated

First, we'll consider the final product. Let's say you've built, loaded, and run a program. (See Listing 1.) The first action the program takes is to clear the display and then prompt the user at line 15 to enter the record number desired or enter a zero to end the program. If you enter 50 as the record number, the program will respond that record 0 (you haven't added any records yet) is the

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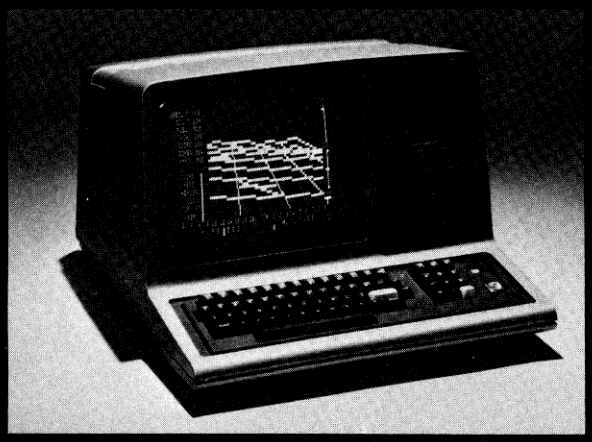

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highest record on file, and will prompt you again for a record number. Enter 1 as the record number and the program will respond with "Record 1 does not exist. Do you want to add it (Y/N)." Enter Y and the program will display the screen to be filled in, with the cursor over the first character of the first field. Type in your name and press the enter key. (Note: The cursor cannot be moved out of the input field.) The cursor moves to the first character of the second input field.

After the screen is filled in, you are prompted: "Enter the number of the item to change. (0 to store screen.)" If you've made any mistakes, enter the field number and the cursor is positioned there. Type the correct entry or move the cursor over the incorrect character and type the correct character over it. Press enter and the field is updated.

When all entries are correct, enter 0 and the screen is stored on the disk; the program then prompts you for another record number. If you enter 1, record 1 is retrieved from disk storage and displayed. The program then prompts you at line 15 for the item number to be changed. Only when entering new records does the program take you through each input field. When you are finished with the record entry and editing, enter 0 as the record number and the program closes all files and ends.

The variables used and a description of the program are in Tables 1 and 2.

The Program Generator

This is the program that lets you create a screen display by typing the display on the CRT. (See Listing 1.) It will scan the screen and save all prompts and input fields. The fields and prompts will then be used to build a program to allow entry and editing by record number and item number.

When you run the program, it will be in the screen-creation mode and the screen will clear. A flashing cursor will be in the upper right corner of the display. Use the four arrow keys to control cursor movement. Press alphanumeric keys to display the corresponding characters at the current cursor location, and the cursor will move one space forward.

The screen size is limited to 14 lines of 64 characters. The bottom two lines are used for prompting the operator during program execution. The clear key has been defined as a control key. The functions available are: CTRL L, for loading a screen from disk; CTRL S, for saving a screen to disk; CTRL D, to delete a line; CTRL I, to insert a line; and CTRL M, to move a line.

Once you have composed a screen, save it to the disk by pressing CTRL and S at the same time. The screen will clear and the prompt "Screen name" will be displayed. Enter up to eight characters with no extension, as /SCR will be appended to the file name.

After the screen is saved it will be displayed again. Press CTRL B to build the program. Line 15 will display the status of the program generation. If a numeric field is found as the screen is being scanned, the program will place a graphics block over the first character of the input field and ask you for the precision of the numeric field.

After decoding the screen, the program will ask for the starting line number and then the increment for lines. The program will then ask for the line number for the INKEY$ routine (50000 is fine). Next the program will ask for the file name (this is for the data file and program file and should only be seven characters long). If two or more data files are needed, the program will append a one or two to the file name and add the extension /DAT.

As the program is generated, the program lines will be displayed on the screen. After generation is completed, the program will be saved to the disk, this time with /PRO appended to the file name. The program will then be loaded and run.

Note: If you have added fields to a program and regenerated it, the file size will be larger, causing a field-overflow error when the program is run. Close and then kill the data file and rerun the program so the proper file size can be established for the disk file.

The program begins by loading PLC

Lines	Function
10–20	Set strings and clear memory, dimension arrays
30–40	Open and field the data files
50–100	Input the record number. If the record is on file, it is retrieved and displayed; if the record number is equal to the last record on file plus one, the program asks if you want to add the record. If so, the buffer is cleared and the flag NE is set. If the record number is greater than the last record plus one, the last record number is printed and the request for the record number is repeated
110–200	Print the disk buffer
210	Check the new flag. If it is set, the user is taken through each input field
220	Enter the item to change, or enter 0 to store the data and return to the record number request
230	Branch to the line to set variables for INKEY$ routine
240	If 0 is entered, store the screen data then branch to the record-number request
250	Branch into the display routine
260	Just for safety
270–350	Set the variables up for calling the INKEY$ routine Load the current value of the disk buffer into IN$ and call line 50000. When execution returns from 50000 IN$ will hold the edited value
50000	Set the number of characters entered to 1, prints IN$ at the prompt location, then backs the cursor up to the first character on the input field. Pads IN$ with blanks to make it equal the input length
50010	PL gets the location of the cursor (the video memory location). PEEK location PL and store character in VB
50020	POKE location PL with CHR$(252) (the cursor), strobe INKEY$ 25 times if no key is input, replace character and strobe INKEY$ again if no character is input, and then branch back to line 50010. If a character is input replace the video character and store ASC of KB$ in KB
50030	If left arrow is on first character GOTO line 50010, else back cursor up one space and subtract 1 from IN
50040	If key is right arrow and number of characters input (IN) is greater than or equal to input length (IL), GOTO 50010; otherwise, move cursor forward one space and increment IL by one
50050	If key is enter then return
50060	If key is greater than or equal to a space and less than or equal to a lowercase z, and if the number of characters input is greater than the input length GOTO 50010. If IN is less than IL, print KB$, change IN$ to match, and increment IN by one. Otherwise, POKE PL with KB and change last character of IN$ to input character. (Printing the character at the last position of the input field moves the cursor out of the input field)
50070	GOTO line 50010

Table 2. Listing 1 Line Functions

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*Michael Tannenbaum, the "80 Accountant"

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Variable	Full Name	Description
V$( )	Video array	Array pointed to the video display
VV$( )	Video verbatim	Array to hold video array during disk I/O
V1$( )	Video one	Array used to hold prompts during screen decoding
FS( )	Field start	Holds starting and ending fields that will fit in a 256-byte record. If the subscript is incremented to 2, then a second disk file is needed
FE( )	Field end	Works with above variable
NB	Number of buffers	Hold number of buffers needed
M( )	Mode	Holds 0 if no input, 1 if string input, 2 if integer input, 3 if single-precision input, 4 if double-precision input
FL	File length	Keeps sum of field lengths: If file length grows larger than 256, the number of buffers is incremented to 2, and the file length is zeroed
L( )	Location	Array to hold Print @ location for prompt
I( )	Input	Array to hold start of input field
IL( )	Input length	Array to hold length of input field
L$( )	Line	Array to hold program lines generated
LL	Line	Used as a subscript for array holding prompts, input locations, lengths during screen decoding
LN	Line number	Holds number of line being scanned during screen decoding
U$( )	Using	Array to hold Using strings for input fields
Q$	Quote	Holds CHR$(34), quote (")
FNST$(T)	Strip	Strips leading blank from number
FNPP(P)	POKE position	Returns location to POKE cursor. Used to point numeric fields out during screen scanning

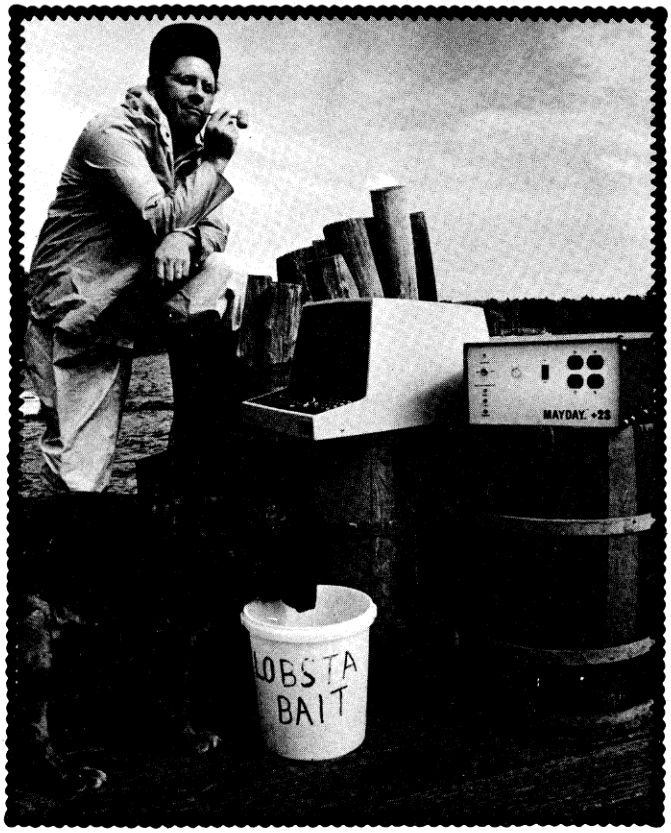
Table 3. Listing 2 Variables

with the starting line number and J with 1. L$(J) will hold the program lines. Each statement needs a line number, and L$(J)=FNST$(PLC) stores the line number for us. FNST$ removes the leading blank by converting the number to a string and returning the second through last digits. To start the next line, a GOSUB 1690 is executed. This

Program Listing 1

```
10 '     ************************************************
20 '     *     1982 Joel Belcher / Weller & Associates   *
30 '     *       P.O BOX 658  MONTICELLO, AR. 71655      *
40 '     *                (501) 367-5235                 *
50 '     ************************************************
60 CLEAR10000:DIMV$(14),VV$(14),V1$(55),L(55),I(55),IL(55),M(55)
,L$(100),U$(55):Q$=CHR$(34):DEFFNST$(A)=MID$(STR$(A),2):EL$=STRI
NG$(63,32)+CHR$(29):J=1:DEFFNPP(I)=((I-1)*64+B1-1)+15360
```

Listing 1 continues



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adds the line increment to the program line counter (PLC) and 1 to J. When the program is saved to the disk, the program is saved in the ASCII format. If a program line is built using graphics characters between quotation marks instead of an alphanumeric string, the graphics characters are saved as the string. When the program is loaded and listed the graphics string is part of the program.

All prompts must have a colon or exclamation point as the last character. The 64th position of a line must be left blank. Only 14 lines are allowed for screens. The input field must be one or more dashes, pound signs or a pound sign preceded by a dollar sign. The numeric fields are saved in U$( ) and placed in a Using statement for the program. If a colon was not found, a scan is made for an exclamation point. If one is found, the line is saved, but no input field is searched for. Field prompts should have a number as the first character (see Fig. 1), because when editing the file the user will need to know the field numbers. ■

Joel Belcher can be reached at P.O. Box 658, Monticello, AR 71655.

Listing 1 continued

```
70 FORII=1TO14:V$(II)=" ":LL=((II-1)*64+15360):V=VARPTR(V$(II)):
POKEV,64:POKEV+1,LLAND255:POKEV+2,LL/256:NEXTII
80 DEFFNVM(P)=PEEK(16416)+PEEK(16417)*256:POKE16419,252
90 IL=64:CLS
100 CLS
110 IN=1:LN=1:PRINTCHR$(28);
120 PL=FNVM(P):VB=PEEK(PL):POKEPL,252:FORW=1TO25:KB$=INKEY$:IFKB
$=""THENNEXTW:POKEPL,VB:FORW=1TO25:KB$=INKEY$:IFKB$=""THENNEXTW:
GOTO120  ELSEW=26:NEXTW:KB=ASC(KB$):POKEPL,VB ELSEW=26:NEXTW:KB=
ASC(KB$):POKEPL,VB
130 IFPEEK(14400)=2ANDKB=76THENGOSUB300  :GOTO110
140 IFPEEK(14400)=2ANDKB=83THENGOSUB290  :CLS:FORI=1TO14:PRINT@(
I-1)*64,VV$(I);:NEXTI:GOTO110
150 IFPEEK(14400)=2ANDKB=90THENPRINTCHR$(143);:IN=IN+1:GOTO120

160 IFPEEK(14400)=2ANDKB=66THEN310
170 IFPEEK(14400)=2ANDKB=77THENPRINT@896,EL$;:INPUT"MOVE LINE ";
F:PRINT@896,EL$;:INPUT"TO ";T:PRINT@896,EL$;:PRINT@(T-1)*64,V$(F
);:GOTO110
180 IFPEEK(14400)=2ANDKB=68THEN:MS=(FNVM(P)-15360)/64+1:ME=15:FO
RI=MSTOME:PRINT@(I-1)*64,V$(I+1);:NEXTI:GOTO110
190 IFPEEK(14400)=2ANDKB=73THEN:MS=(FNVM(P)-15360)/64:ME=14:FORI
=METOMSSTEP-1:PRINT@(I)*64,V$(I);:NEXTI:GOTO110
200 IFKB=8THENIFIN=1THEN120  ELSEIN=IN-1:PRINTCHR$(24);:POKE1644
4,0:GOTO120
210 IFKB=24THENPRINTSTRING$(IN-1,24);:IN=1:GOTO120
220 IFKB=25THENPRINTSTRING$(64-IN,25);:IN=64:GOTO120
230 IFKB=9THENIFIN>=ILTHEN120  ELSEIN=IN+1:PRINTCHR$(25);:POKE16
444,0:GOTO120
240 IFKB=91THENIFLN=1THEN120  ELSEPRINTCHR$(27);:LN=LN-1:POKE164
44,0:GOTO120
250 IFKB=10THENIFLN>=14THEN120  ELSEPRINTCHR$(26);:LN=LN+1:POKE1
6444,0:GOTO120
260 '
270 IFKB>=32ANDKB<=123THENIFIN>ILTHEN120  ELSEIFIN<ILTHENPRINTKB
$;:IN=IN+1:GOTO120  ELSEPOKEPL,KB:GOTO120
280 GOTO120
290 FORI=1TO14:VV$(I)=V$(I):NEXTI:CLS:INPUT"SCREEN NAME ";SN$:OP
EN"R",1,SN$+"/SCR",64:FIELD 1,64 AS V0$:FORI=1TO14:LSETV0$=VV$(I
):PUT1,I:NEXTI:CLOSE1:RETURN
```

Listing 1 continues

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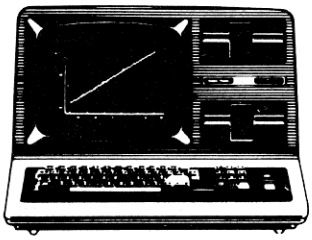
Listing 1 continued

```
300 CLS:INPUT"SCREEN NAME ";SN$:OPEN"R",1,SN$+"/SCR",64:FIELD 1,
64 AS V0$:FORI=1TO14:GET1,I:VV$(I)=V0$:PRINT@(I-1)*64,V0$;:NEXTI
:CLOSE:RETURN
310 '
320 P$(1)="TYPE ? (2)=INTEGER (3)=SINGLE PREC (4)=DOUBLE PREC"
330 FS(1)=1:NB=1
340 '
350 PRINT@896,EL$;"WORKING ON SCREEN";
360 LL=1:FORI=1TO14:I1=1
370 FORII=I1TOLEN(VV$(I)):IFMID$(VV$(I),II,1)>" "THENL(LL)=(I-1)
*64+II-1:A1=II:II=70:NEXTII ELSENEXTII:I1=69:GOTO560
380 A2=INSTR(A1,VV$(I),":"):IF A2=0 THEN A2=INSTR(A1,VV$(I),"!")
-1
390 V1$(LL)=MID$(VV$(I),A1,A2-(A1-1))
400 IFINSTR(A2,VV$(I),"-")THENT1=INSTR(A2,VV$(I),"-")ELSET1=80
410 IFINSTR(A2,VV$(I),"#")THENT2=INSTR(A2,VV$(I),"#")ELSET2=80
420 IFINSTR(A2,VV$(I),"$")=T2-1THENT2=T2-1
430 IFT2<T1THENB1=T2:D=PEEK(FNPP(I)):POKEFNPP(I),252:PRINT@896,E
L$;I;",";LL;P$(1);:INPUTM(LL):PRINT@896,EL$;:POKEFNPP(I),D:ELSEB
1=T1:M(LL)=1
440 IF T2=T1 AND V1$(LL)="" THEN NEXT I:GOTO 570  ELSE IFT2=T1TH
ENM(LL)=0:I1=A2+1:GOTO560
450 I(LL)=(I-1)*64+B1-1
460 B2=INSTR(B1+1,VV$(I)," ")
470 IFM(LL)>1THENU$(LL)=MID$(VV$(I),B1,B2-B1)
480 I1=B2:IL(LL)=B2-B1
490 IFM(LL)=0THENLA=0
500 IFM(LL)=1THENLA=IL(LL)
510 IFM(LL)=2THENLA=2
520 IFM(LL)=3THENLA=4
530 IFM(LL)=4THENLA=8
540 FL=FL+LA:IF FL>256 THENFL(NB)=FL-LA:FE(NB)=LL-1:FL=LA:NB=NB+
1:FS(NB)=LL ELSEFL(NB)=FL:FE(NB)=LL
550 '
560 IFI1<=64THENPRINT@896,EL$;"WORKING ON SCREEN LINE"I"ITEM"LL;
:LL=LL+1:GOTO370  ELSENEXTI
570 FL(NB)=FL
580 PRINT@896,EL$;:INPUT"STARTING LINE ";PLC
590 PRINT@896,EL$;:INPUT"INC FOR LINES ";INC
600 PRINT@896,EL$;:INPUT"FILENAME ";DF$
610 '
620 PRINT@896,EL$;:INPUT"LINE NUMBER FOR INKEY SUBROUTINE ";SLC
630 L$(J)=FNST$(PLC)+" CLS:DIM F$("+FNST$(LL)+")"
640 GOSUB1690
650 L$(J)=FNST$(PLC)+" EL$=STRING$(63,32)+CHR$(29):DEFFNVM(P)=PE
EK(16416)+PEEK(16417)*256:DEFFNST$(T)=MID$(STR$(T),2)"
660 GOSUB1690
670 L$(J)=FNST$(PLC)+" "
680 FORI=1TONB
690 L$(J)=L$(J)+"OPEN"+Q$+"R"+Q$+","+FNST$(I)+","+Q$+DF$+FNST$(I
)+"/DAT"+Q$+","+FNST$(FL(I))+":"
700 NEXTI
710 L$(J)=L$(J)+"LR=LOF(1)"
720 FORK=1TONB:FL=0:GOSUB1690 :L$(J)=FNST$(PLC)+" FIELD "+FNST$(
K)
730 FORI=FS(K)TOFE(K)
740 IFM(I)=1THENL$(J)=L$(J)+","+FNST$(IL(I))+"ASF$("+FNST$(I)+")
":LA=IL(I)
750 IFM(I)=2THENL$(J)=L$(J)+","+"2ASF$("+FNST$(I)+")":LA=2
760 IFM(I)=3THENL$(J)=L$(J)+","+"4ASF$("+FNST$(I)+")":LA=4
770 IFM(I)=4THENL$(J)=L$(J)+","+"8ASF$("+FNST$(I)+")":LA=8
780 IFLEN(L$(J))>240THENI=I-1:L$(J)=LEFT$(L$(J),L):GOSUB1690 :L$
(J)=FNST$(PLC)+" FIELD "+FNST$(K)+","+FNST$(FL)+"ASSH$":FL=0 ELS
EFL=FL+LA:L=LEN(L$(J))
790 NEXTI
800 NEXTK
810 GOSUB1690 :CRN=PLC
820 L$(J)=FNST$(PLC)+" ?@ 896,EL$;:INPUT"+Q$+"RECORD NUMBER (0 T
O QUIT) "+Q$+";RN"
830 GOSUB1690
840 L$(J)=FNST$(PLC)+" IF RN=0 THEN CLOSE:CLS:END"
850 GOSUB1690
860 L$(J)=FNST$(PLC)+" IF RN>LR+1 THEN ?"+Q$+"RECORD"+Q$+"LR"+Q$
+"IS THE HIGHEST RECORD ON FILE"+Q$+";:GOTO"+FNST$(CRN)
870 GOSUB1690
880 L$(J)=FNST$(PLC)+" IF RN=LR+1 THEN ?@896,EL$;"+Q$+"RECORD"+Q
$+"RN"+Q$+"DOES NOT EXIST. DO YOU WANT TO ADD IT (Y/N) "+Q$+";:I
NPUTYN$:IFYN$="+Q$+"N"+Q$+"THEN"+FNST$(CRN)
890 GOSUB1690
900 L$(J)=FNST$(PLC)+" IF RN>LR THEN NE=-1:IC=0 ELSE"
910 FORI=1TONB
920 L$(J)=L$(J)+"GET"+FNST$(I)+",RN:"
930 NEXTI
940 L$(J)=L$(J)+"GOTO":ER=PLC:X=J:JP=2
950 GOSUB1690
960 L$(J)=FNST$(PLC)+" "
970 FORI=1TOLL-1:IFLEN(L$(J))>236THENI=I-1:L$(J)=LEFT$(L$(J),L):
JP=JP+1:GOSUB1690 :L$(J)=FNST$(PLC)+" " ELSEL=LEN(L$(J))-1
```

Listing 1 continues

TRS-80 MODEL III



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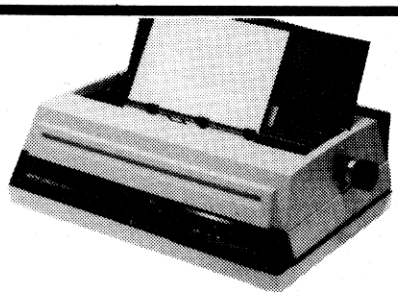

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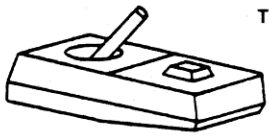

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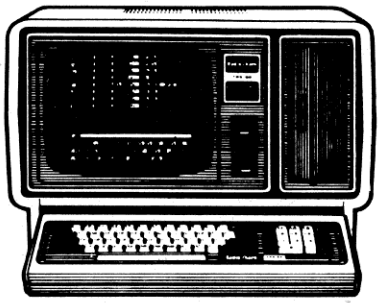
Listing 1 continued

```
980 IFM(I)=1THENL$(J)=L$(J)+"LSETF$("+FNST$(I)+")="+Q$+Q$
990 IFM(I)=2THENL$(J)=L$(J)+"LSETF$("+FNST$(I)+")=MKI$(0)"
1000 IFM(I)=3THENL$(J)=L$(J)+"LSETF$("+FNST$(I)+")=MKS$(0)"
1010 IFM(I)=4THENL$(J)=L$(J)+"LSETF$("+FNST$(I)+")=MKD$(0)"
1020 IFM(I)>0THENL$(J)=L$(J)+":"
1030 NEXTI
1040 IFRIGHT$(L$(J),1)=":"THENL$(J)=LEFT$(L$(J),LEN(L$(J))-1)
1050 L$(X)=L$(X)+FNST$(ER+INC*JP)
1060 GOSUB1690
1070 L$(J)=FNST$(PLC)+" CLS":DL=PLC
1080 GOSUB1690
1090 FORK=1TOLL-1
1100 L$(J)=FNST$(PLC)+" ?@"+FNST$(L(K))+","+Q$+V1$(K)+Q$+";"+":?
@"+FNST$(I(K))+","
1110 IFM(K)=0THENL$(J)=LEFT$(L$(J),INSTR(L$(J),";"))
1120 IFM(K)=1THENL$(J)=L$(J)+"F$("+FNST$(K)+")"
1130 IFM(K)=2THENL$(J)=L$(J)+"USING"+Q$+U$(K)+Q$+";CVI(F$("+FNST
$(K)+"));"
1140 IFM(K)=3THENL$(J)=L$(J)+"USING"+Q$+U$(K)+Q$+";CVS(F$("+FNST
$(K)+"));"
1150 IFM(K)=4THENL$(J)=L$(J)+"USING"+Q$+U$(K)+Q$+";CVD(F$("+FNST
$(K)+"));"
1160 GOSUB1690
1170 NEXTK
1180 '
1190 L$(J)=FNST$(PLC)+" IF NE THEN IC=IC+1: IF IC>"+FNST$(LL-1)+
"THEN NE=0 ELSE"+FNST$(PLC+INC*2)
1200 GOSUB1690
1210 L$(J)=FNST$(PLC)+" ?@896,EL$;:INPUT"+Q$+"ITEM NUMBER TO CHA
NGE (0 TO QUIT) "+Q$+";IC"
1220 GOSUB1690
1230 L$(J)=FNST$(PLC)+" ON IC GOSUB"
1240 FORI=1TOLL-1
1250 IFM(I)>0THENL$(J)=L$(J)+FNST$(PLC+INC*(3+I))+","
1260 NEXTI
1270 L$(J)=LEFT$(L$(J),LEN(L$(J))-1)
1280 GOSUB1690
1290 L$(J)=FNST$(PLC)+" IFIC=0THEN":FORI=1TONB
1300 L$(J)=L$(J)+"PUT"+FNST$(I)+",RN:"
1310 NEXTI
1320 L$(J)=L$(J)+"IFRN>LRTHENLR=RN:GOTO"+FNST$(CRN)+"ELSE"+FNST$
(CRN)
1330 GOSUB1690
1340 L$(J)=FNST$(PLC)+" ON IC GOTO"
1350 FORI=1TOLL-1
1360 IFM(I)>0THENL$(J)=L$(J)+FNST$(DL+INC*I)+","
1370 NEXTI
1380 L$(J)=LEFT$(L$(J),LEN(L$(J))-1)
1390 GOSUB1690
1400 L$(J)=L$(J)+FNST$(PLC)+" GOTO"+FNST$(DLC)
1410 GOSUB1690
1420 FORI=1TOLL-1
1430 L$(J)=FNST$(PLC)+" ?@896,EL$;:I="+FNST$(I(I))+":IL="+FNST$(
IL(I))+":"
1440 IFM(I)=0THENL$(J)=L$(J)+"'"
1450 IFM(I)=1THENL$(J)=L$(J)+"IN$=F$("+FNST$(I)+"):GOSUB"+FNST$(
SLC)+":LSETF$("+FNST$(I)+")=IN$:RETURN"
1460 IFM(I)=2THENL$(J)=L$(J)+"IN$=FNST$(CVI(F$("+FNST$(I)+"))):G
OSUB"+FNST$(SLC)+":LSETF$("+FNST$(I)+")=MKI$(VAL(IN$)):RETURN"
1470 IFM(I)=3THENL$(J)=L$(J)+"IN$=FNST$(CVS(F$("+FNST$(I)+"))):G
OSUB"+FNST$(SLC)+":LSETF$("+FNST$(I)+")=MKS$(VAL(IN$)):RETURN"
1480 IFM(I)=4THENL$(J)=L$(J)+"IN$=FNST$(CVD(F$("+FNST$(I)+"))):G
OSUB"+FNST$(SLC)+":LSETF$("+FNST$(I)+")=MKD$(VAL(IN$)):RETURN"
1490 GOSUB1690
1500 NEXTI
1510 PLC=SLC'SUBROUTINE LINE COUNTER
1520 L$(J)=FNST$(PLC)+" IN=1:?@I,IN$;STRING$(IL-LEN(IN$),32);STR
ING$(IL,24);:IN$=IN$+STRING$(IL-LEN(IN$),32)
1530 GOSUB1690
1540 L$(J)=FNST$(PLC)+" PL=FNVM(P):VB=PEEK(PL)"
1550 ER=PLC
1560 GOSUB1690
1570 L$(J)=FNST$(PLC)+" POKEPL,252:FORW=1TO25:KB$=INKEY$:IFKB$="
+Q$+Q$+"THENNEXTW:POKEPL,VB:FORW=1TO25:KB$=INKEY$:IFKB$="+Q$+Q$+
"THENNEXTW:GOTO"+FNST$(PLC)+"ELSEW=26:NEXTW:KB=ASC(KB$):POKEPL,V
BELSEW=26:NEXTW:KB=ASC(KB$):POKEPL,VB"
1580 GOSUB1690
1590 L$(J)=FNST$(PLC)+" IFKB=8THENIFIN=1THEN"+FNST$(ER)+"ELSEIN=
IN-1:?CHR$(24);"
1600 GOSUB1690
1610 L$(J)=FNST$(PLC)+" IFKB=9THENIFIN>=ILTHEN"+FNST$(ER)+"ELSEI
N=IN+1:?CHR$(25);"
1620 GOSUB1690
1630 L$(J)=FNST$(PLC)+" IFKB=13THENRETURN"
1640 GOSUB1690
1650 L$(J)=FNST$(PLC)+" IFKB>=32ANDKB<=123THENIFIN>ILTHEN"+FNST$
(ER)+"ELSEIFIN<ILTHEN?KB$;:MID$(IN$,IN,1)=KB$:IN=IN+1ELSEPOKEPL,
KB:MID$(IN$,IN,1)=KB$"
1660 GOSUB1690
```

Listing 1 continues

TRS-80 MODEL II



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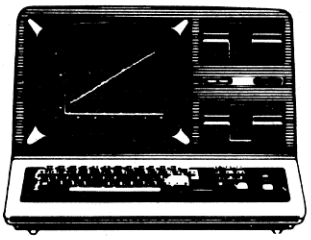

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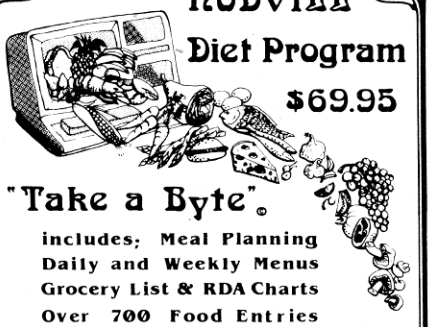

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Listing 1 continued

```
1670 L$(J)=FNST$(PLC)+" GOTO"+FNST$(ER)
1680 PRINT"DONE----SAVING PROGRAM AS ";:F$=DF$+"/PRO":PRINTF$:OP
EN"O",1,F$:FORK=1TOJ:PRINT#1,L$(K):NEXTK:CLOSE1:PRINT"RUNNING "F
$;:RUNF$
1690 PRINTL$(J):PLC=PLC+INC:J=J+1:RETURN
```

```
10 CLS:DIM F$(10)
20 EL$=STRING$(63,32)+CHR$(29):DEFFNVM(P)=PEEK(16416)+PEEK(16417
)*256:DEFFNST$(T)=MID$(STR$(T),2)
30 OPEN"R",1,"DEMO1/DAT",77:LR=LOF(1)
40 FIELD 1,16ASF$(2),2ASF$(3),16ASF$(4),1ASF$(5),16ASF$(6),16ASF
$(7),2ASF$(8),8ASF$(9)
50 PRINT@ 896,EL$;:INPUT"RECORD NUMBER (0 TO QUIT) ";RN
60 IF RN=0 THEN CLOSE:CLS:END
70 IF RN>LR+1 THEN PRINT"RECORD"LR"IS THE HIGHEST RECORD ON FILE
";:GOTO50
80 IF RN=LR+1 THEN PRINT@896,EL$;"RECORD"RN"DOES NOT EXIST. DO Y
OU WANT TO ADD IT (Y/N) ";:INPUTYN$:IFYN$="N"THEN50
90 IF RN>LR THEN NE=-1:IC=0 ELSEGET1,RN:GOTO110
100 LSETF$(2)="":LSETF$(3)=MKI$(0):LSETF$(4)="":LSETF$(5)="":LSE
TF$(6)="":LSETF$(7)="":LSETF$(8)="":LSETF$(9)=MKD$(0)
110 CLS
120 PRINT@10,"Program Generation Demo Screen";
130 PRINT@128,"(1) Name    :";:PRINT@142,F$(2)
140 PRINT@172,"(2) Age :";:PRINT@182,USING"###";CVI(F$(3));
150 PRINT@192,"(3) Address :";:PRINT@206,F$(4)
160 PRINT@236,"(4) Sex :";:PRINT@246,F$(5)
170 PRINT@256,"(5) Address :";:PRINT@270,F$(6)
180 PRINT@320,"(6) City    :";:PRINT@334,F$(7)
190 PRINT@384,"(7) State   :";:PRINT@398,F$(8)
200 PRINT@448,"(8) Zip     :";:PRINT@462,USING"#####";CVD(F$(9))
;
210 IF NE THEN IC=IC+1: IF IC>9THEN NE=0 ELSE230
220 PRINT@896,EL$;:INPUT"ITEM NUMBER TO CHANGE (0 TO QUIT) ";IC
230 ON IC GOSUB280,290,300,310,320,330,340,350
240 IFIC=0THENPUT1,RN:IFRN>LRTHENLR=RN:GOTO50ELSE50
250 ON IC GOTO130,140,150,160,170,180,190,200
260 GOTO110
270 PRINT@896,EL$;:I=0:IL=0:'
280 PRINT@896,EL$;:I=142:IL=16:IN$=F$(2):GOSUB50000:LSETF$(2)=IN
$:RETURN
290 PRINT@896,EL$;:I=182:IL=3:IN$=FNST$(CVI(F$(3))):GOSUB50000:L
SETF$(3)=MKI$(VAL(IN$)):RETURN
300 PRINT@896,EL$;:I=206:IL=16:IN$=F$(4):GOSUB50000:LSETF$(4)=IN
$:RETURN
310 PRINT@896,EL$;:I=246:IL=1:IN$=F$(5):GOSUB50000:LSETF$(5)=IN$
:RETURN
320 PRINT@896,EL$;:I=270:IL=16:IN$=F$(6):GOSUB50000:LSETF$(6)=IN
$:RETURN
330 PRINT@896,EL$;:I=334:IL=16:IN$=F$(7):GOSUB50000:LSETF$(7)=IN
$:RETURN
340 PRINT@896,EL$;:I=398:IL=2:IN$=F$(8):GOSUB50000:LSETF$(8)=IN$
:RETURN
350 PRINT@896,EL$;:I=462:IL=5:IN$=FNST$(CVD(F$(9))):GOSUB50000:L
SETF$(9)=MKD$(VAL(IN$)):RETURN
50000 IN=1:PRINT@I,IN$;STRING$(IL-LEN(IN$),32);STRING$(IL,24);:I
N$=IN$+STRING$(IL-LEN(IN$),32)
50010 PL=FNVM(P):VB=PEEK(PL)
50020 POKEPL,252:FORW=1TO25:KB$=INKEY$:IFKB$=""THENNEXTW:POKEPL,
VB:FORW=1TO25:KB$=INKEY$:IFKB$=""THENNEXTW:GOTO50020ELSEW=26:NEX
TW:KB=ASC(KB$):POKEPL,VBELSEW=26:NEXTW:KB=ASC(KB$):POKEPL,VB
50030 IFKB=8THENIFIN=1THEN50010ELSEIN=IN-1:PRINTCHR$(24);
50040 IFKB=9THENIFIN>=ILTHEN50010ELSEIN=IN+1:PRINTCHR$(25);
50050 IFKB=13THENRETURN
50060 IFKB>=32ANDKB<=123THENIFIN>ILTHEN50010ELSEIFIN<ILTHENPRINT
KB$;:MID$(IN$,IN,1)=KB$:IN=IN+1ELSEPOKEPL,KB:MID$(IN$,IN,1)=KB$
50070 GOTO50010
```

Program Listing 2

```
Program Generation Demo Screen!

(1) Name    : ----------------          (2) Age : ###
(3) Address : ----------------          (4) Sex : -
(5) Address : ----------------
(6) City    : ----------------
(7) State   : --
(8) Zip     : #####
```

Figure 1

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for peripheral cards; a joystick/paddle connector. A full 72-key typewriter-style keyboard that includes 12 key numeric pad, upper/lower case with shift and alpha lock, full cursor control, and special keys for use with Visicalc. Built into the unit is a 50-watt power supply and cooling fans which permit use of all 8 peripheral expansion slots without power or overheating problems.

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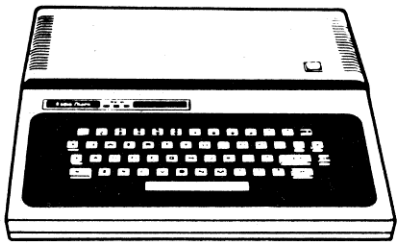
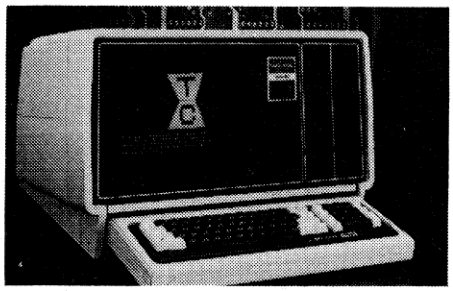


16K	LEVEL I	$279
16K	EXTENDED	$379
32K	EXTENDED	$529

TRS-80 MODEL 16



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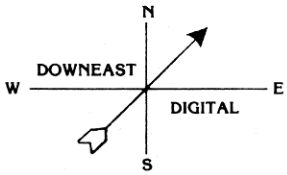

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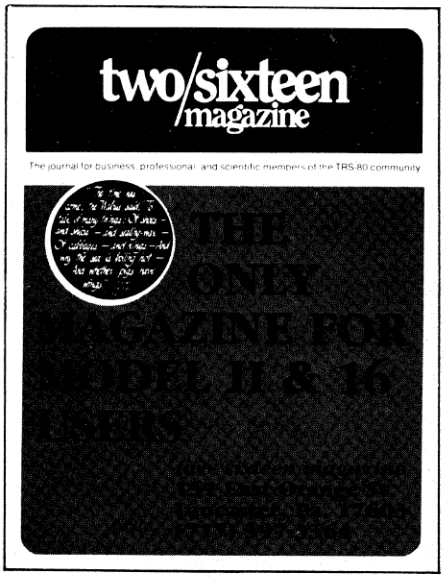

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Lines	Function
60	Clears string storage, dimensions array
70	Points V$( ) to video memory so V$(1) is first line of video display, V$(2) is second line, and so on
110	Sets number of characters input to 1 and line number to 1, then homes cursor
120	PEEKs cursor location and stores character, then POKEs a graphics block in that location. INKEY is scanned until key is input
130–190	If clear key is depressed (PEEK(14400) = 2) and (L)oad, (S)ave, (I)nsert, (D)elete, (M)ove, or (B)uild depressed then perform function
200–250	If arrow key or shift arrow key depressed then move cursor in proper direction
270	If key is >= blank and key is <= lowercase z, and if the number of characters input is > input length then go to line 120. If number of characters input is < input length then print character input. Otherwise, POKE character input into video memory
290	Save screen to disk
300	Load screen from disk
330	Set field start to 1 (FS(1) = 1) and number of buffers to 1 (NB = 1). Field start and field end (FE( )) hold the items that will fit in the 256 characters allowed for a record. If more than 256 characters are needed, FS(2) to FE(2) will hold the item for the second disk file. The program will create as many disk files as are needed to hold the screen
360	LL is a counter for each item read. Loop from first line to 14th line. I1 holds last character checked
370	Loop from I1 to LEN of screen line. If the character is > blank then store location as Print@ position for prompt, store character count in A1, and terminate loop. Otherwise continue loop. If the loop terminates without finding a character > blank then store a number > 64 in I1 so line will not be scanned again
380	Look for : and store its position in A2; if not found look for ! and store its position minus 1 in A2
390	Get prompt from position A1 to A2 and store it in V1$( )
400	Look at characters for last prompt forward for input field –, #, or $. $ is only used if followed by #
430	Load B1 with start of input field. If it is a numeric field (T2<T1) place a graphics block over the first character of the field and prompt for precision for field. Otherwise, load B1 with start of field and set mode to 1 (M( ) = 1)
440	If T1 equals T2 and no prompt found (V1$(LL) = " ") then go to the next line. Otherwise, set mode to 0
450	Load I(LL) with input location
460	Find end of input field
470	If mode is > 1 then get using string from position B1 to B2
480	Calculate input length
490–530	Based on mode, load LA with proper size for field statement
540	Sum field size to file length. If file length is > 256 characters then: file length (first buffer) = field length–last amount; file end (first buffer) = LL – 1; field length = last amount; increment number of buffers to 2; file start (second buffer) = LL. Otherwise: file length (first buffer) = field length; and file end (first buffer) = LL
560	If last character checked (I1) <= 64 then print line currently working on and go to 370; else, next line
580–1690	Asks for the starting line number, the increment between lines, and the file names for the program and data files. The program will have /PRO appended to its file name and the data file will have /DAT appended to its name. If more than one file is required, the file name will include the file number
630	Starts building the program. L$(J) will hold each line built. GOSUB 1690 increments J by one and adds the line increment to the program line counter (PLC). Quotation marks must surround strings in a print statement. They are entered by using Q$. PRINT "THIS IS A TEST" is built by L$(J) = "?" + Q$ + "THIS IS A TEST" + Q$. Basic requires a string to be surrounded by quote marks, but quote marks cannot be part of a string
680–700	Build the open statements for the data files (like OPEN"R",1,"FILENAME",196)
720–800	Builds the field statements. If one grows larger than 240 characters a new line is started
810	Stores a pointer for a branch back to "Change the Record Number," used in line 880
910	Stores the array pointer J and the line number. These are used by line 1050 to finish the jump-past-the-buffer nulling statements if the record is already on file
1070	Stores the line number of the start of the display to use later

Table 4. Listing 2 Line Functions

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The disk drives we sell for the Model III are the Tandon drives. Drive 0 includes the controller board, power supply, cables and all mounting hardware. Complete instructions are included for installation. It takes 30 minutes to an hour to install disk drives in a Model III. No soldering is required. TRSDOS operating system is not included in this low price.

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80 Track, Double	$349	80 Track, Double	$399

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We sell two brands of disk drives for the TRS-80: the TEAC and the Tandon. The TEAC disk drive has a 1 year warranty, the Tandon has a 90 day warranty. The TEAC uses a lead screw actuator, the Tandon uses a split band type actuator. The track to track access rate for the Tandon is 5 milliseconds, as opposed to 25 milliseconds for the TEAC. The TRS-80 Model III requires a faster drive speed than the Model I, therefore the Tandon works better with the Model III. With the slower drive speed requirements of the Model I, the TEAC is a more reliable drive. We have both 40 track and 80 track drives with either single or dual head. All drives are capable of double density. These drives are available either bare or complete with power supply and cabinet. A cable is required to hook up the drives. We have both two-drive and four-drive cables. All drives come with complete instructions for hooking up a system. TEACs and Tandons can be intermixed with other drives on the same system.

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Peek Pong

by Charles Gulick

Peek Pong demonstrates that the illusion of speed is possible even in Basic, if the programmer uses all the tools at his command. You'll find it challenging and worth the time it takes to type it in.

The action is like that in ping pong or handball, and your opponent never misses. The object is to return the ball as many times as possible to an unseen adversary who hits it toward you at random angles. Your best score during any playing session is displayed as the "Score to Beat," and the score for your last set is also given.

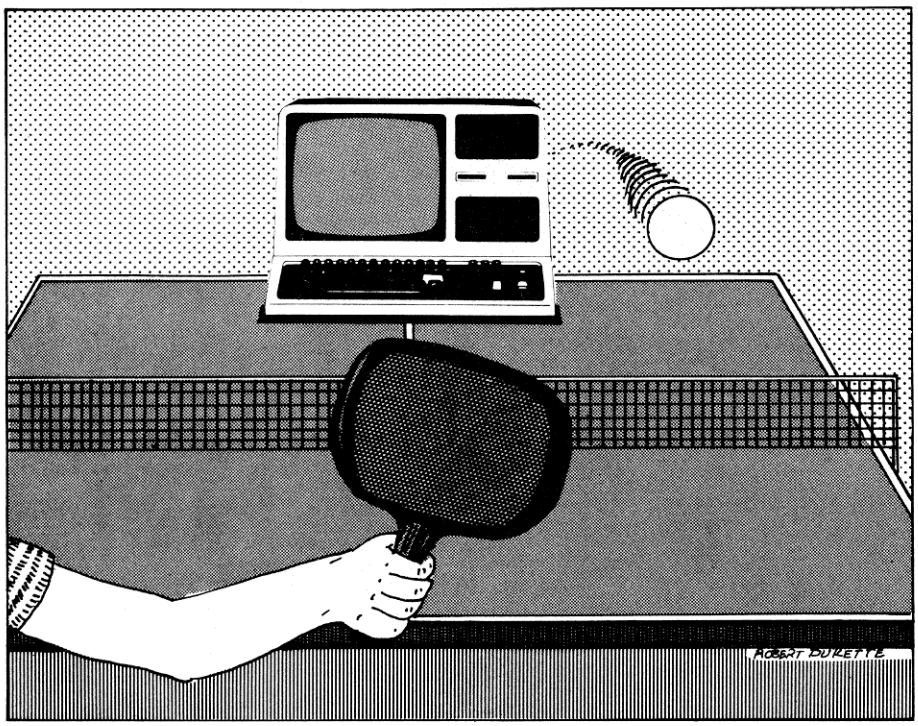
If you thought fast-paced games couldn't be written in Basic, Peek Pong should surprise you.

The Action

I perked up this game with an audio module, so turn on your amplifier/speaker system before loading. Answer CASS? with enter, and answer the memory-size prompt with 32746, and then CLOAD and run.

The message "K to play, Q to quit" appears midscreen. A reminder of the paddle control keys appears on the right side of the screen. The three controls were chosen for their convenient positions. Place the first two fingers of your right hand over the < and > keys. These keys move the paddle left and right. Place a finger of your left hand over the S. This key stops the paddle in its mad dash back and forth. This control is crucial for getting higher scores.

When you miss the ball, you hear a five-note raspberry. On the Model I an 8 shows you where you were; on the Model III an X. To play again, hit K, and immediately get in position for the next serve. That's all there is to playing Peek Pong.



The Program

Lines 330 and 340 POKE the sound subroutine into high memory. Line 310 calls the random sounds. Lines 20–40 POKE the walls into video RAM (VIDRAM), although the top wall is invisible. Line 50 prints the masthead and the midscreen K/Q message.

Line 70 creates the paddle. It must be three 131s wide, because the paddle moves that far for each depression of < or >. This is a key trick for speeding up the action. It also means you will not always be able to position the paddle so the ball hits it in the center. Thus, some judgement comes into play.

The action for each game begins at line 80, which provides for random release of the ball by your unseen opponent. The ball (B = 176) shows up at line 90, to which the play continues to return until you miss. This line also calls forth the bounce sound if the ball and paddle meet. Note S is reinitialized here to zero

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16K RAM
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until the sound is needed again.

Lines 100–140 watch for your control keys, and keep busy erasing and re-POKEing the racket according to your instructions. Line 150 erases and moves the ball to its next POKE location at a speed slightly under the speed of light. Lines 170–190 check the top, left, and right walls to see whether the ball is about to bounce, in which event they summon the bounce sound and redirect the ball.

Line 200 is where your paddle contacts and returns the ball and hits are scored. Line 210 records the more likely event that the paddle does not hit the ball, and you get X (8 on Model I) and a little tune to cheer you up for the next round. Line 230 GOSUBs five times to the USR function and randomizes the notes.

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Whence the Speed?

Peek Pong is fast—sometimes frustratingly so. And this proves that Basic need not be regarded as the arch enemy of graphic games action. Several hurry-up features are incorporated into this program. PEEKing and POKEing are themselves faster than PRINT @s, and at least in this game environment, faster than Set/Reset techniques. Moving the paddle in increments of three also speeds the action, as does elimination of all spaces between characters. Randomizing the ball's angle off the top (invisible) wall, rather than having it bounce logically (as it does off the side walls) simulates a crafty opponent and adds liveliness to the action. Even the inclusion of sound adds to the feel of fast action.

Here's a tip for when you have trouble making contact with the ball: Use S to stop the paddle in the vicinity of the ball's descending trajectory.

The computer can make an absolutely lethal shot that will prevent the game from going on forever. It occasionally wields this blow from a corner, and no amount of dexterity will save you. Also, some of the serves will prove to be aces, unless you're psychic and have speed-of-light reactions. ■

Charles Gulick can be reached at 300 W. Royal Palm Road, Boca Raton, FL 33432.

```
2 'PEEK PONG - by Charles Gulick, Apt. 412C, 300 W. Royal Palm
Rd., Boca Raton FL 33432. 3/8/82
10 RANDOM:CLS:GOSUB330:GOSUB310:PRINTCHR$(23):PRINT@472,"PEEK PO
NG":FORT=0TO750:NEXT
20 CLS:GOSUB310:FORX=15424TO15487:POKEX,128:NEXT
30 GOSUB310:FORX=15489TO16257STEP64:POKEX,191:NEXT
40 GOSUB310:FORX=15550TO16318STEP64:POKEX,191:NEXT
50 GOSUB310:PRINT@0,"PEEK PONG        SCORE:        SCORE TO BEAT:
      INKEYS: < S >";:GOTO260
60 FORX=16320TO16383:POKEX,128:NEXT
70 R=16339+RND(20):POKER,131:POKER+1,131:POKER+2,131:J=3
80 B=176:W=15509+RND(20):D=61+(2*RND(2))
90 POKEW,B:IFS=1GOSUB310:S=0
100 P$=INKEY$:IFP$="."THENJ=1ELSEIFP$=","THENJ=2ELSEIFP$="S"THEN
J=3
110 IFJ<>3POKER,128:POKER+1,128:POKER+2,128
120 IFJ=1THENR=R+3ELSEIFJ=2THENR=R-3
130 IFR>16380THENR=16380ELSEIFR<16321THENR=16321
140 IFJ<>3POKER,131:POKER+1,131:POKER+2,131
150 POKEW,32:W=W+D
170 IFPEEK(W-64)=128S=1:D=61+(2*RND(2))
180 IFPEEK(W-1)=191S=1:D=D+2
190 IFPEEK(W+1)=191S=1:D=D-2
200 IFPEEK(W+D)=131S=1:D=D-128:H=H+1:PRINT@24,H;
210 IFPEEK(W+D)=128THEN230ELSE90
230 POKEW+D,120:FORX=0TO10:NEXT:GOSUB310:E=E+1:IFE=5THEN250
240 POKEW+D,32:GOTO230
250 PRINT@24,H;:IFH>BHTHENBH=H
260 PRINT@45,BH;:PRINT@533,"K TO PLAY  Q TO QUIT";
270 A$=INKEY$:IFA$="K"THENH=0:E=0:PRINT@533,STRING$(20," ");:PRI
NT@24,H;:GOTO60
280 IFA$="Q"THENCLS:PRINTCHR$(23):PRINT@472,"THANKS!":FORT=0TO75
0:NEXT:GOTO290ELSE270
290 FORX=1TO4:GOSUB310:FORW=1TO10:NEXTW:NEXTX:CLS:END
310 S=USR(2600+RND(100)):RETURN
330 POKE16526,235:POKE16527,127:FORX=32747TO32767:READB:POKEX,B:
NEXT:RETURN
340 DATA205,127,10,62,5,211,255,69,16,254,62,4,211,255,69,16,254
,37,32,239,201
```

Program Listing

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Color Life

by Larry F. Perry

Teach your students about the development of communities of organisms with this revised Game of Life for the Color Computer.

As a teacher of environmental biology, I thought the Game of Life could be useful in classroom discussions of communities of organisms. Unfortunately, I found that my Color Computer Life program, written in Basic, bored my students because it was too slow. So, I added some machine-language calls from Basic, and Color Life is the result.

As explained in the program's introduction, John Conway designed the original Life program in the late 1960s. It is a mathematical game that simulates the rise, fall, and alterations of a society of living organisms.

When you run Color Life (Program Listing 1), the title page is displayed while the machine-language subroutines are POKEd into memory. Almost all programs I've seen that POKE machine code into memory use data statements and decimal numbers. Since I use hexadecimal numbers frequently, I decided it would be easier to use strings of hex numbers, read those strings two characters at a time using lines 150–200, and let the computer convert all of the numbers.

After the title page is displayed, you are asked if you need instructions. If you do, press Y. If you don't, press any other key. You are then asked if you want to step through the generations, one generation at a time. Stepping lets you observe each generation carefully. Press Y to activate the step mode. To display the next generation when in the step mode, press the space bar. If you don't want to step, press enter.

After making your step selection, you are asked to select the speed at which the generations are to be displayed. Press 1 or enter for fast, 2 for medium, or 3 for slow. At this point you are told how to change the speed of the display and how to get into the step mode during the game. If you decide to add a glider (a small number of organisms that move while repeating the same series of patterns) or some other pattern to the one on the screen while the game is in progress, press C. If you want to get out of the step mode while the game is in progress, press G.

After selecting a speed, you are given another set of instructions and questions. You can either start your own colony or let the computer place a random population on the screen. Press 1 if you decide to place your own colony; press 2 for the computer placement.

To speed up the placement of a colony, I incorporated the following time-saving options: for placing an organism, press 0; to delete, position the cursor over the square you want to eliminate, and press clear; to place preprogrammed sample colonies, position the cursor wherever you like and press 1, 2, or 3; and to speed your own insertion you can advance the cursor left, right, up, or down each time you insert or delete by pressing L, R, U, or D. The latter step makes inserting your own colony fast and easy. When you finish placing your colony, press S. You will be greeted by a few notes that might sound familiar to you.

When the program begins, the generation number is displayed at the top left of the screen, and the population number is at the top right. These two items are a must if you want to know what is happening to your colony. Color Life also displays the births and deaths of the organisms. If all the organisms die, Color Life ends and tells you at what generation they died. If the colony stabilizes, or you want to start another colony, press E, and you will be asked the series of questions again. That's it for the Basic program.

Now for the "miracle worker." I wrote this for those of you who know

Program Listing 1

```
5 REM    HX = START ADDRESS OF MACHINE LANGUAGE SUBROUTINE
10 CLEAR500:HX=&H6F7
20 CLS:PRINTSTRING$(32,191);:PRINTSTRING$(32,"*");
30 PRINTSTRING$(64,175);:PRINT"      C O L O R  L I F E "
40 PRINTSTRING$(32,159);:PRINT"         VERSION 2.0"
50 PRINTSTRING$(32,239);:PRINT"    WRITTEN BY L.F. PERRY":PRINTS
TRING$(32,255);:PRINT"      JANUARY 31, 1982":PRINTSTRING$(64,19
```

Listing 1 continues

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nothing about programming in Assembly language and think it is too hard or abstract. I split the program into three parts and wrote them in a form that closely resembles the logic of a Basic program. This is not efficient, and it makes the program execute more slowly, but it demonstrates that writing machine-language subroutines is not as difficult as you might think.

In Program Listing 2, the routine loads in the start address and checks to see if each screen address has a birth or death marker in it. It replaces the black death-marker with a white block and replaces a blue birth-marker with a red block. After looking at all screen addresses, it returns to the Basic program.

The routine in Program Listing 3 is even simpler. The first screen address is loaded in and checked for a red block. If it has one, then the X register has 1 added to it. Then, the next screen position is checked. After all screen addresses are checked, the number in the X register is stored at 6FE and 6FF, and then control returns to Basic.

The most complicated routine is in Program Listing 4. The beginning screen address is loaded and checked to see if it has an organism. If not, then each of the eight surrounding squares are checked to see if they contain red or black blocks. The B accumulator is incremented each time one is found. If at the end of the check the B accumulator equals 3, then a blue block is placed at that position. When a block is placed, or when the B accumulator doesn't equal 3, nothing happens, and the next screen position is checked. When a red block is encountered, a label is stored at address 6FD. (In this case I used the number 1 for the label.) This tells the computer that the square being checked contains an organism. The same series of events happens here. Each address around the central block is checked, but when the program gets to the address 7F9 hex, it finds that a 1 is stored at hex 6FD. Then the program branches to the routine telling it to place a death marker (black block) in the position if less than two or more than three organisms surround the central block. The screen address is then checked for the end, and the program either continues, if the end of screen is not encountered, or returns to Basic. The comments should help you to follow the logic of the program if you aren't familiar with Assembly language.

You might want to change the background color or the colors that are used in this program to show births, deaths, and adults. To change the background color, alter lines 480 and 690 so they

Listing 1 continued

```
1);:PRINTSTRING$(32,"*");:PRINTSTRING$(32,175);
55 REM    HEX NUMBERS FOR SUBROUTINE
60 D$="CFAF80BF00000000008E0420A680B106F82705200E121212B606FAA78
28C060025EA39B106F9270320F312B606F7A7828C060025D739121212"
70 E$="108E00008E0420A680B106FA270A8C060025F410BF06FE39312120F21
21212121212121212121212"
80 F$="8E0420A6805FF706FDB106F7270FB106FA27031600998601B706FD121
2301EA680B106F92707B106FA270220015C3001A680B106F92707B106FA27022
0015C3088DDA680B106F92707B106FA270220015CA680B106F92707B106FA270
220015CA680B106F92707B106FA270220015C30883DA680"
90 G$="B106F92707B106FA270220015CA680B106F92707B106FA270220015CA
680B106F92707B106FA270220015C3088DEB606FD8101270EC103271930018C0
6001025FF4D39C10227F2C10327EEB606F9A78020E9B606F8A78020E2121212"
95 REM    GET THE SUBROUTINE
100 Z$=D$:GOSUB150
110 Z$=E$:GOSUB150
120 Z$=F$:GOSUB150
130 Z$=G$:GOSUB150
140 GOTO210
145 REM    POKE SUBROUTINE INTO MEMORY
150 FORX=1TO LEN(Z$)STEP2
160 X$=MID$(Z$,X,2)
170 POKEHX,VAL("&H"+X$)
180 HX=HX+1
190 NEXTX
200 RETURN
205 REM    END POKE SUBROUTINE
210 GOTO1170
215 REM    BACKGROUND INFO ON LIFE GAME
220 CLS:PRINT" JOHN CONWAY, A MATHEMATICIAN ATCAMBRIDGE UNIVERSI
TY, CAME UP   WITH 'LIFE' IN THE LATE 1960'S. IT IS A MATHEMATIC
AL GAME WHICH SIMULATES THE RISE, FALL, AND   ALTERATIONS OF A S
OCIETY OF     LIVING ORGANISMS."
230 PRINT" THE IDEA IS TO START WITH A    SIMPLE CONFIGURATION O
F          ORGANISMS AND OBSERVE THEIR     PROGRESS AS CONWAY'S '
LAWS' ARE APPLIED TO BIRTHS, DEATHS, AND  SURVIVORS.
            PRESS ENTER"
240 EE$=INKEY$:IFEE$=""THEN240
250 CLS:PRINT" THE LAWS WILL PRODUCE THE      FOLLOWING RESULTS:
 A. THERE WILLBE NO INITIAL CONFIGURATION THATCAN GROW WITHOUT L
IMIT. B. THEREWILL BE INITIAL CONFIGURATIONS  THAT WILL APPARENT
LY GROW WITH- OUT LIMIT. C. ALL PATTERNS,"
260 PRINT"AFTER SOME PERIOD OF TIME, WILL FADE AWAY COMPLETELY E
ITHER FROMOVER OR UNDER POPULATION, BECOMESTABLE PATTERNS, OR EN
TER INTO  OSCILLATING PHASES IN WHICH THE CONFIGURATIONS REPEAT
THE SAME  PATTERNS ENDLESSLY.                 PRESS ENTER"
270 EE$=INKEY$:IFEE$=""THEN270
280 CLS:PRINT" THE 'LAWS' ARE SIMPLE. EACH    ORGANISM HAS EIGHT
 SURROUNDING  CELLS (PLACES AN ORGANISM CAN   LIVE). THE RULES F
OR LIFE,      BIRTH, AND DEATH ARE:           1) SURVIVAL: EACH
ORGANISM WITH TWO OR THREE NEIGHBORS WILL"
290 PRINT"LIVE TO THE NEXT GENERATION.    2) DEATH: EACH ORGANIS
M WITH ONEOR ZERO NEIGHBORS WILL DIE FROM ISOLATION. EACH ORGANI
SM WITH   FOUR OR MORE NEIGHBORS DIES FROMOVERPOPULATION.
            PRESS ENTER"
300 EE$=INKEY$:IFEE$=""THEN300
310 CLS
320 PRINT"3) BIRTH: EACH EMPTY CELL WITH  EXACTLY THREE NEIGHBOR
S WILL    GIVE BIRTH TO A NEW ORGANISM.   BIRTHS DO NOT AFFECT A
NY OTHER  CELLS UNTIL THEY BECOME ADULTS.  PRESS ENTER TO START
GAME.
330 EE$=INKEY$:IFEE$=""THEN330
340 CLS:GOTO540
345 REM    BEGINNING OF LOOP TO LOOK AT SCREEN, CHANGE SCREEN, A
ND COUNT ORGANISMS
346 REM    PUT GENERATION NUMBER AND ORGANISM COUNT ON SCREEN
350 PRINT@4,GE;:PRINT@20,PP;:GE=GE+1
355 REM    CHECK FOR STEPPING GENERATIONS
360 IFXX=1GOTO950
370 A$=INKEY$
375 REM    CHECK FOR KEY PRESSED
380 IFA$="F"THENSP=1ELSEIFA$="M"THENSP=300ELSEIFA$="S"THENSP=600
ELSEIFA$="G"THENXX=0ELSEIFA$="E"THEN550ELSEIFA$="C"THEN710ELSEIF
A$="L"THENXX=1
385 REM    DEFINE ADDRESS FOR ROUTINE TO CHECK BIRTHS, DEATHS AN
D PLACE THEM
390 DEFUSR0=&H757
395 REM    DELAY TO SLOW DOWN DISPLAY
400 FORX=1TO SP:NEXTX
405 REM   CALL BIRTH/DEATH ROUTINE
410 BF=USR(0)
415 REM    DELAY TO SLOW DOWN DISPLAY, SET POP TO 0 TO READY FOR
 NEXT COUNT
420 PP=0:FORX=1TO SP:NEXTX
425 REM    CALL ROUTINE TO CHANGE BIRTHS TO ADULTS (RED) AND REM
OVE THE DEATHS (BLACK)
```

Listing 1 continues

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✓ 60

The prices in the January issue are not current.
The publisher apologizes for running the wrong ad.

*TANDY CORP. TRADEMARK

produce the color you want. Next, figure out the number that represents that particular solid color block. For instance, CHR$(207) is the solid block for white and CHR$(191) is red. Change the number to hex. An example would be, PRINT HEX$(191). The computer will print BF, the hexadecimal number for 191.

Now that you know the procedure to find the hex number, look at line 60 in the program. The first part of the string is CFAF80BF. The computer looks at this to determine the color of the block with which it compares the screen address or loads the accumulator in the machine-language subroutines. The CF = white block, AF = blue block, 80 = black block, and BF = red block. The first one is the screen color, so change it if you don't want a white background. The other three numbers can be changed to other colors to represent the births, deaths, and adult organisms. If you want to change other aspects of the program, the variables are listed in Table 1. ■

Larry F. Perry can be reached at 920 Baldwin St., Denton, TX 76201.

Listing 1 continued

```
430 DEFUSR0=&H700:BF=USR(0)
435 REM    CALL ROUTINE TO COUNT NUMBER OF ORGANISMS - PLACES TH
AT NUMBER AT ADDRESSES 6FE & 6FF
440 DEFUSR0=&H730:BF=USR(0)
445 REM    LOOK AT ADDRESSES WHERE POPULATION COUNT IS STORED, C
HANGE TO DECIMAL, GIVE TO PP
450 H$=HEX$(PEEK(&H6FE)):I$=HEX$(PEEK(&H6FF)):PP=VAL("&H"+H$+I$)
455 REM    IF POPULATION IS 0 END DISPLAY
460 IFPP=0THEN880
470 GOTO350
475 REM    END OF SCREEN LOOP
476 REM    PLACE RANDOM POPULATION ON SCREEN
480 CLS(5)
490 FOR X=1056TO1535
500 RN=RND(5)
510 IFRN=2THENPOKEX,&HBF
520 NEXTX
530 GG=0:GOSUB1210:GOTO420
535 REM    END OF RANDOM POPULATION ROUTINE
536 REM    SET GEN AND POP TO ZERO
540 GE=0:PP=0
545 REM    SELECT OPTIONS
550 GOSUB1010:CLS:PRINT" YOU HAVE A CHOICE BETWEEN      STARTING
 YOUR OWN COLONY OR     LETTING THE COMPUTER START ONE. 1) START
 OWN COLONY             2) LET COMPUTER START COLONY    3) END G
AME"
560 PRINT:PRINT"A BLUE SQUARE INDICATES A BIRTH,A BLACK SQUARE A
 DEATH, AND A   RED SQUARE A LIVE ORGANISM.":PRINT:PRINT" NOTE:I
F THE COLONY DIES OR YOU WANT TO START OVER PRESS <E>.
570 PRINT:PRINT"PICK (1), (2), OR (3)."
580 BB$=INKEY$:IFBB$=""THEN580
590 IF BB$="1"THENGE=0:GOTO630
600 IF BB$="2"THENGE=0:GOTO480
610 IF BB$="3"THENEND
620 GOTO580
625 REM    INSTRUCTIONS FOR PLACING ORGANISMS
630 CLS: PRINT"PRESS THE UP, DOWN, LEFT, OR    RIGHT ARROW TO PO
SITION CURSOR  OVER POINT YOU WANT AN ORGANISM TO BE PLACED. PRE
SS <O> AND A   RED SQUARE WILL REPLACE THE     CURSOR. WHEN YOU
HAVE PLACED ALL";
```

Listing 1 continues

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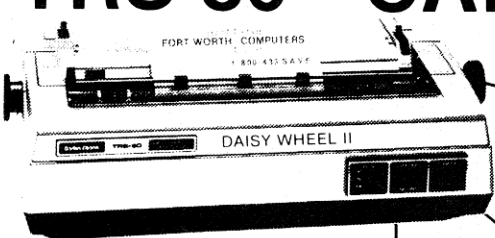

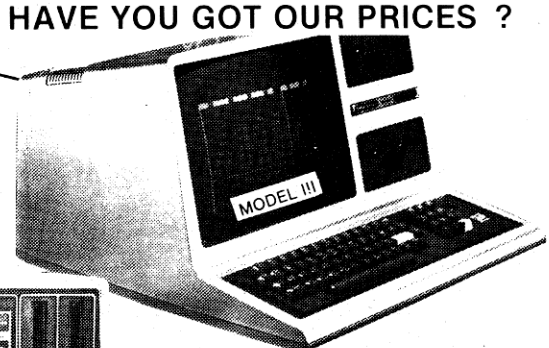

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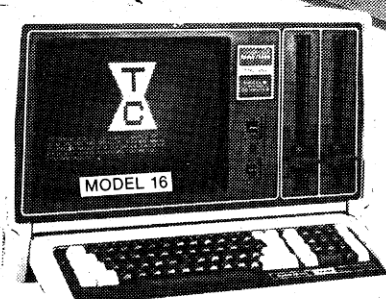

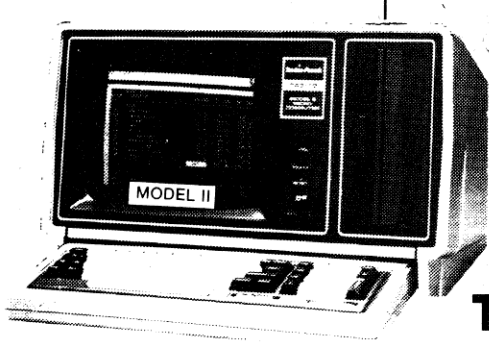

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Listing 1 continued

```
640 PRINT"OF YOUR ORGANISMS PRESS <S> AND THE GAME WILL START.
650 PRINT"IF YOU WANT CURSOR TO MOVE IN A CERTAIN DIRECTION WHEN
 INSERTINGOR DELETING PRESS <U>, <D>, <L>,OR <R> AND IT WILL ADV
ANCE EACH TIME THE <O> IS PRESSED."
660 PRINT"TO DELETE A BLOCK PRESS <CLEAR>,TO PLACE A GLIDER PRES
S <G>."
670 PRINT" PRESS ANY KEY TO START";
680 CC$=INKEY$:IFCC$=""THEN680
685 REM    THIS SECTION ALLOWS USER TO PLACE ORGANISMS ON SCREEN
690 CLS(5)
700 GG=1056
710 IFGG<1056THENGG=1056
720 IFGG>1535THENGG=1535
730 ZG=PEEK(GG):POKEGG,176:FORX=1TO10:NEXTX:POKEGG,207:FORX=1TO1
0:NEXTX:POKEGG,ZG
740 A$=INKEY$:IFA$=""THEN710
750 IFA$=CHR$(12)THENPOKEGG,&HCF:IFPS=1THENGG=GG+1ELSEIFPS=2THEN
GG=GG-1ELSEIFPS=3THENGG=GG-32ELSEIFPS=4THENGG=GG+32
760 IFA$="G"THENPOKEGG,191:POKEGG+1,191:POKEGG+2,191:POKEGG+1-64
,191:POKEGG+2-32,191
770 IFA$=CHR$(9)THENPOKEGG,ZG:GG=GG+1:GOTO710
775 REM    SELECTION OF 1,2, OR 3 PUTS SAMPLE POPULATION ON SCRE
EN AT CURSOR LOCATION
780 IFA$="1"GOSUB920
790 IFA$="2"GOSUB930
800 IFA$="3"GOSUB940
810 IFA$=CHR$(8)THENPOKEGG,ZG:GG=GG-1:GOTO710
820 IFA$=CHR$(10)THENPOKEGG,ZG:GG=GG+32:GOTO710
830 IFA$=CHR$(94)THENPOKEGG,ZG:GG=GG-32:GOTO710
840 IFA$="O"THENPOKEGG,191:IFPS=1THENGG=GG+1ELSEIFPS=2THENGG=GG-
1ELSEIFPS=3THENGG=GG-32ELSEIFPS=4THENGG=GG+32
850 IFA$="U"THENPS=3ELSEIFA$="D"THENPS=4ELSEIFA$="R"THENPS=1ELSE
IFA$="L"THENPS=2
860 IFA$="S"THENPOKEGG,ZG:PLAY"O3;D#FC#;O2;C#G#":GOSUB1210:PS=0:
GOTO420
870 GOTO740
875 REM    END OF PLACEMENT LOOP
876 REM    DISPLAYS GENERATION AT WHICH POPULATION DIED
880 CLS:PRINT@256,"COLONY DIED AT"GE"GENERATIONS"
890 PRINT:PRINT"   PRESS ANY KEY TO START AGAIN"
900 E$=INKEY$:IFE$=""THEN900
910 GOTO340
915 REM    THREE SAMPLE POPULATIONS
920 POKEGG,191:POKEGG+1,191:POKEGG+2,191:POKEGG+1-32,191:RETURN
930 POKEGG,191:POKEGG+1,191:POKEGG+2,191:POKEGG+32,191:POKEGG+2+
32,191:POKEGG+64,191:POKEGG+2+64,191:RETURN
940 POKEGG,191:POKEGG+32,191:POKEGG+1,191:POKEGG+2,191:POKEGG+3,
191:POKEGG+4,191:POKEGG+5,191:POKEGG+5+32,191:RETURN
945 REM    STEPPING ROUTINE
950 DL$=INKEY$:IFDL$=""THEN950
960 IFDL$=CHR$(32)THEN370
970 IFDL$="G"THENXX=0:GOTO420
980 IFDL$="E"THEN550
990 IFDL$="C"THEN710
1000 GOTO950
1005 REM    END STEPPING ROUTINE
1006 REM    SELECT STEP Y OR N - DEFAULT IS NO
1010 CLS:PRINT@32*3,"DO YOU WANT TO STEP THROUGH THE GENERATIONS
?"
1020 AB$=INKEY$:IFAB$=""THEN1020
1030 IFAB$="Y"THENXX=1:GOTO1050
1040 XX=0
1050 CLS
1055 REM    SELECT SPEED - DEFAULT IS FAST
1060 PRINT:PRINT"SELECT THE SPEED YOU WANT."
1070 PRINT" 1)  FAST    (3 GEN/SEC)
1080 PRINT" 2)  MEDIUM  (35 GEN/MIN)"
1090 PRINT" 3)  SLOW    (20 GEN/MIN)"
1100 PRINT@32*6,"NOTE: TO CHANGE SPEED OF DISPLAY      WHEN GAME
 IS IN PROGRESS        PRESS <F> FOR FAST, <M>        FOR MEDIU
M, AND <S> FOR         SLOW SPEED.  TO GET GAME       INTO STEP
 MODE PRESS <L>."
1110 PRINT"      TO ADD ORGANISMS TO THE         COLONY PRESS <C
>. TO GET        OUT OF STEP MODE PRESS <G>";
1120 SP$=INKEY$:IFSP$=""THEN1120
1130 IFSP$="1"THENSP=1:RETURN
1140 IFSP$="2"THENSP=300:RETURN
1150 IFSP$="3"THENSP=600:RETURN
1160 SP=1:RETURN
1170 CLS:PRINT@32*5,"DO YOU NEED INSTRUCTIONS?"
1180 A$=INKEY$:IFA$=""THEN1180
1190 IFA$="Y"THEN220
1200 GOTO540
1205 REM    PRINT AT TOP OF DISPLAY SCREEN - GEN & POP
1210 PRINT@0,STRING$(32,143);:PRINT@0,"GEN:":PRINT@16,"POP:";:RE
TURN
```

Article continues

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```
0000          ******************************************
0000          * THIS SUBROUTINE REMOVES THE            *
0000          * DEATHS AND CHANGES ANY BIRTHS          *
0000          * TO ADULTS                              *
0000          ******************************************
0700            ORG     $700
0700 8E0420     LDX     #$420 START OF SCREEN
0703 A680       LDA     0,X+ GET COLOR OF BLOCK
0705          *AT THIS ADDRESS.
0705 B106F8     CMPA    $6F8 IS COLOR BLUE?
0708 2705       BEQ     $70F YES, THEN BRANCH
070A 200E       BRA     $71A NO, THEN BRANCH AND
070C          *CHECK FOR BLACK BLOCK.
070C 12         NOP
070D 12         NOP
070E 12         NOP
070F B606FA     LDA     $6FA GET A RED BLOCK
0712 A782       STA 0,-X PUT THE RED BLOCK
0714          *IN THE ADDRESS BEING CHECKED.
0714 8C0600     CMPX    #$600 END OF SCREEN?
0717 25EA       BCS     $703 NO, GET THE NEXT
0719          *SCREEN ADDRESS.
0719 39         RTS     YES, THEN RETURN TO BASIC
071A B106F9     CMPA    $6F9 IS COLOR BLACK?
071D 2703       BEQ     $722 YES, THEN BRANCH.
071F 20F3       BRA     $714 NO, GO CHECK END OF
0721          *SCREEN
0721 12         NOP
0722 B606F7     LDA     $6F7 GET A WHITE BLOCK.
0725 A782       STA     0,-X PUT WHITE BLOCK
0727          *WHERE THE BLACK ONE IS.
0727 8C0600     CMPX    #$600 END OF SCREEN?
072A 25D7       BCS     $703 NO, THEN GET THE
072C          *NEXT SCREEN ADDRESS.
072C 39         RTS     YES, THEN RETURN TO BASIC
072D 12         NOP
```

Program Listing 2

```
0000          ******************************************
0000          * THIS SUBROUTINE COUNTS THE             *
0000          * POPULATION AND STORES THE              *
0000          * RESULT AT ADDRESS $6FE & $6FF          *
0000          ******************************************
0730            ORG     $730
0730 108E0000   LDY     #$0000      CLEAR Y REGISTER
0734          *TO ZERO
0734 8E0420     LDX     #$420       START OF SCREEN
0737 A680       LDA     0,X+        GET COLOR STORED AT
0739          *THIS ADDRESS.
0739 B106FA     CMPA    $6FA        IS THE COLOR RED?
073C 270A       BEQ     $748        YES, THEN BRANCH.
073E 8C0600     CMPX    #$600       END OF SCREEN?
0741 25F4       BCS     $737        NO, THEN GET THE
0743          *NEXT ADDRESS.
0743 10BF06FE   STY     $6FE        YES, STORE THE
747           *COUNT AT $6FE & $6FF
0747          *(THIS IS # OF ORGANISMS.)
0747 39         RTS                 RETURN TO BASIC.
0748 3121       LEAY    1,Y         ADD ONE TO COUNT.
074A 20F2       BRA     $73E        GO CHECK SCREEN
074C          *ADDRESS.
074C 12         NOP
```

Program Listing 3

Article continues

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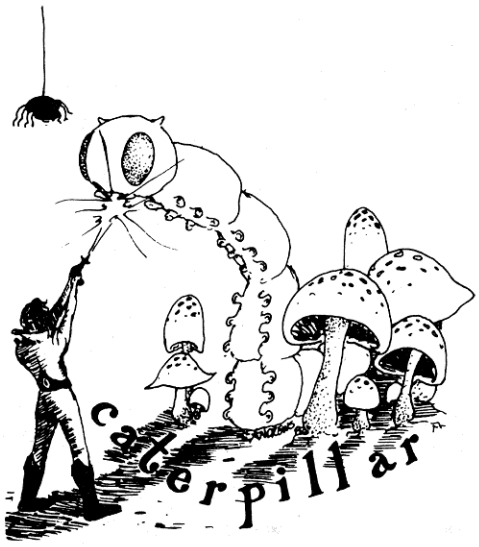
Adventures require 16k on TRS80, TRS80 color, and Sinclair. They require 8k on OSI and 13k on Vic-20. Derelict takes 12k on OSI. $14.95 each.



CATERPILLAR

O.K., the Caterpillar does look a lot like a Centipede. We have spiders, falling fleas, monsters traipsing across the screen, poison mushrooms, and a lot of other familiar stuff. COLOR 80 requires 16k and Joysticks. This is Edson's best game to date. $19.95 for TRS 80 COLOR.

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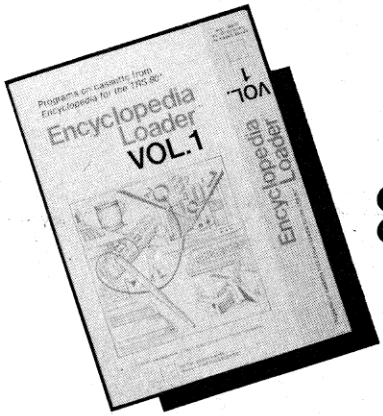

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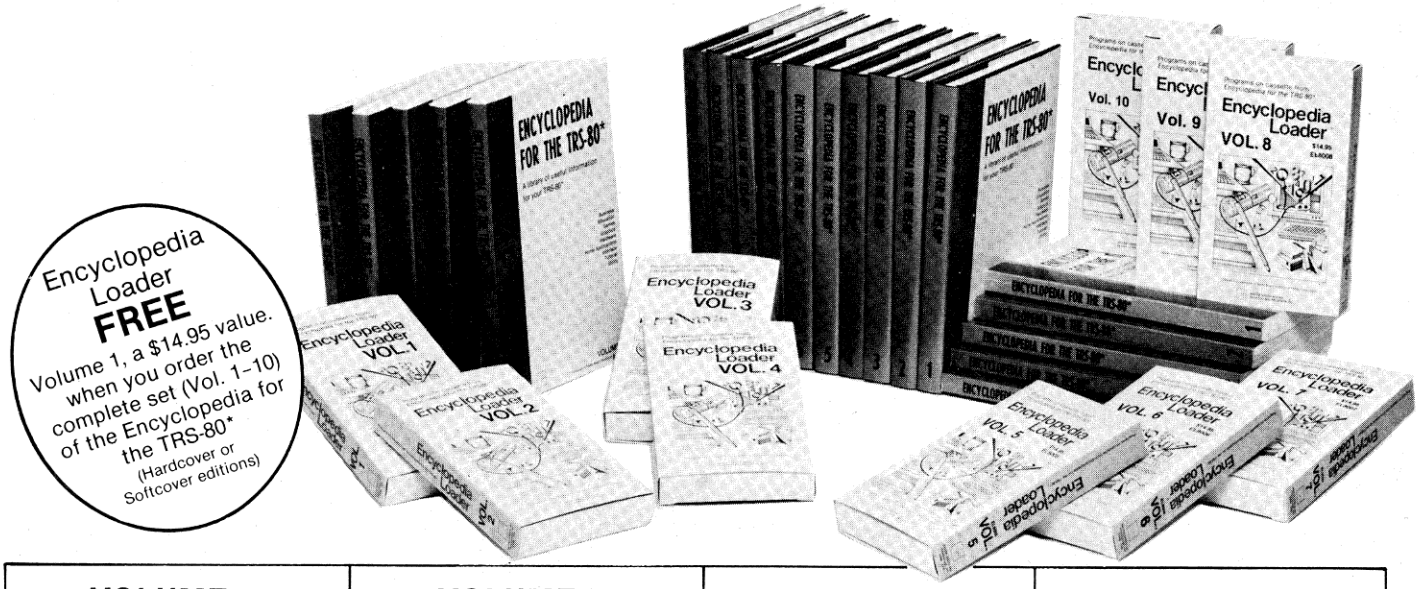

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HX	Beginning of area used by machine-language subroutine
D$	Machine code to eliminate death cells, change birth cells to adult organisms
E$	Machine code to count number of organisms
F$	Machine code to check for births and deaths and mark them
G$	Machine code to check for births and deaths and mark them
Z$	Temporary variable to load machine code into memory
X$	Number POKEd into memory
GE	Number of generations
PP	Number of organisms in population
XX	If XX = 1, then Step generations
SP	1 = fast display, 300 = medium display, 600 = slow display (delay)
GG	Screen address used in placing organisms on screen
ZG	Temporary storage for number stored at GG
PS	Variable to advance cursor for GG

Important Addresses:

HEX	$6F7: White Block
	$6F8: Blue Block
	$6F9: Black Block
	$6FA: Red Block

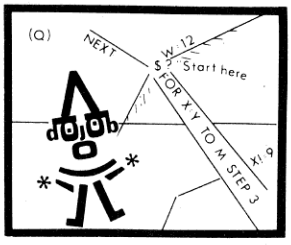
Table 1. Program Variables

Program Listing 4

```
0000              ********************************
0000              * THIS SUBROUTINE CHECKS THE 8 *
0000              * SURROUNDING SCREEN ADDRESSES *
0000              * FOR EACH SCREEN LOCATION AND *
0000              * PLACES BIRTHS OR DEATHS IF   *
0000              * THE PROPER CONDITIONS ARE    *
0000              * MET.                         *
0000              ********************************
0757                ORG   $757
0757 8E0420         LDX   #$420  START OF SCREEN
075A A680           LDA   0,X+   GET THE COLOR AT
075C              *THIS ADDRESS.
075C 5F             CLRB  CLEAR THE B ACCUMULATOR.
075D F706FD         STB   $6FD   CLEAR ADDRESS $6FD
0760 B106F7         CMPA  $6F7   IS IT WHITE?
0763 270F           BEQ   $774   YES, THEN BRANCH
0765              *AND CHECK FOR POSSIBLE BIRTH.
0765 B106FA         CMPA  $6FA   IS IT RED?
0768 2703           BEQ   $76D   YES, THEN BRANCH
076A              *AND CHECK FOR POSSIBLE DEATH.
076A 160099         LBRA  $806   GO CHECK SCREEN
076D              *FOR END.
076D 8601           LDA   #$01   THIS IS A LABEL -
076F              *LOOKING FOR A DEATH.
076F B706FD         STA   $6FD   STORE LABEL HERE.
0772 12             NOP
0773 12             NOP
0774 301E           LEAX  -2,X   SUBTRACT TO GET
0776              *THE ADDRESS OF SQUARE ON LEFT.
0776 A680           LDA   0,X+   GET COLOR OF SQUARE
0778              *AT THE LEFT.
0778 B106F9         CMPA  $6F9   IS IT BLACK?
077B 2707           BEQ   $784   YES, THEN BRANCH.
077D B106FA         CMPA  $6FA   IS IT RED?
0780 2702           BEQ   $784   YES, THEN BRANCH.
0782 2001           BRA   $785   NOTHING FOUND, GO.
0784 5C             INCB  ADD ONE TO COUNT.
0785 3001           LEAX  1,X    ADD ONE TO SCREEN
0787              *ADDRESS.
0787 A680           LDA   0,X+   GET COLOR OF SQUARE
0789 B106F9         CMPA  $6F9   IS IT BLACK?
```

Listing 4 continues

Lost in the Line Edit Jungle?



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OTHER ADD	Other Add
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Listing 4 continued

```
078C 2707        BEQ  $795  YES, THEN BRANCH.
078E B106FA      CMPA  $6FA  IS IT RED?
0791 2702        BEQ  $795  YES, THEN BRANCH.
0793 2001        BRA  $796  NOTHING FOUND, GO.
0795 5C          INCB  ADD ONE TO COUNT.
0796 3088DD      LEAX  -35,X    SUBTRACT TO GET
0799           *NEXT SCREEN ADDRESS.
0799 A680        LDA  0,X+  GET COLOR OF SQUARE
079B B106F9      CMPA  $6F9  IS SQUARE BLACK?
079E 2707        BEQ  $7A7  YES, THEN BRANCH.
07A0 B106FA      CMPA  $6FA  IS SQUARE RED?
07A3 2702        BEQ  $7A7  YES, THEN BRANCH.
07A5 2001        BRA  $7A8  NOTHING FOUND, GO.
07A7 5C          INCB  ADD ONE TO COUNT.
07A8 A680        LDA  0,X+  GET COLOR OF SQUARE
07AA B106F9      CMPA  $6F9  IS IT BLACK?
07AD 2707        BEQ  $7B6  YES, THEN BRANCH.
07AF B106FA      CMPA  $6FA  IS IT RED?
07B2 2702        BEQ  $7B6  YES, THEN BRANCH.
07B4 2001        BRA  $7B7  NOTHING FOUND, GO.
07B6 5C          INCB  ADD ONE TO COUNT.
07B7 A680        LDA  0,X+  GET COLOR OF SQUARE
07B9 B106F9      CMPA  $6F9  IS IT BLACK?
07BC 2707        BEQ  $7C5  YES, THEN BRANCH.
07BE B106FA      CMPA  $6FA  IS IT RED?
07C1 2702        BEQ  $7C5  YES, THEN BRANCH.
07C3 2001        BRA  $7C6  NOTHING FOUND, GO.
07C5 5C          INCB  ADD ONE TO COUNT.
07C6 30883D      LEAX  $3D,X  ADD # TO GET THE
07C9           *NEXT SCREEN ADDRESS.
07C9 A680        LDA  0,X+  GET COLOR OF SQUARE
07CB B106F9      CMPA  $6F9  IS IT BLACK?
07CE 2707        BEQ  $7D7  YES, THEN BRANCH.
07D0 B106FA      CMPA  $6FA  IS IT RED?
07D3 2702        BEQ  $7D7  YES, THEN BRANCH.
07D5 2001        BRA  $7D8  NOTHING FOUND, GO.
07D7 5C          INCB  ADD ONE TO COUNT.
07D8 A680        LDA  0,X+  GET COLOR OF SQUARE
07DA B106F9      CMPA  $6F9  IS IT BLACK?
07DD 2707        BEQ  $7E6  YES, THEN BRANCH.
07DF B106FA      CMPA  $6FA  IS IT RED?
07E2 2702        BEQ  $7E6  YES, THEN BRANCH.
07E4 2001        BRA  $7E7  NOTHING FOUND, GO.
07E6 5C          INCB  ADD ONE TO COUNT.
07E7 A680        LDA  0,X+  GET COLOR OF SQUARE
07E9 B106F9      CMPA  $6F9  IS IT BLACK?
07EC 2707        BEQ  $7F5  YES, THEN BRANCH.
07EE B106FA      CMPA  $6FA  IS IT RED?
07F1 2702        BEQ  $7F5  YES, THEN BRANCH.
07F3 2001        BRA  $7F6  NOTHING FOUND, GO.
07F5 5C          INCB  ADD ONE TO COUNT.
07F6 3088DE      LEAX  -34,X    SUBTRACT # TO
07F9           *GET THE ORIGINAL ADDRESS
07F9 B606FD      LDA  $6FD  GET THE LABEL.
07FC 8101        CMPA  #$01  IS LABEL ONE?
07FE 270E        BEQ  $80E  YES, THEN BRANCH.
0800 C103        CMPB  #$03  ARE THERE ONLY 3
0802           *ORGANISMS (POSSIBLE BIRTH).
0802 2719        BEQ  $81D  YES, THEN BRANCH.
0804 3001        LEAX  1,X  NO, ADD ONE TO THE
0806           *SCREEN ADDRESS.
0806 8C0600      CMPX  #$600  END OF SCREEN?
0809 1025FF4D    LBCS  $75A  NO, START AGAIN.
080D 39          RTS  YES, RETURN TO BASIC.
080E C102        CMPB  #$02  ARE THERE ONLY TWO
0810           *ORGANISMS COUNTED AROUND THE
0810           *CENTER ONE?
0810 27F2        BEQ  $804  YES, THEN ORGANISM
0812           *WILL LIVE, BRANCH.
0812 C103        CMPB  #$03  ARE THERE ONLY
0814           *THREE ORGANISMS COUNTED AROUND
0814           *THE CENTER ONE?
0814 27EE        BEQ  $804  YES, THEN ORGANISM
0816           *WILL LIVE, BRANCH.
0816 B606F9      LDA  $6F9  GET BLACK MARKER.
0819           *TOO MANY ORGANISM, OR TOO FEW.
0819 A780        STA  0,X+  PLACE BLACK MARKER
081B           *IN ORIGINAL BLOCK CHECKED.
081B 20E9        BRA  $806  GO CHECK FOR THE
081D           *END OF SCREEN.
081D B606F8      LDA  $6F8  GET A BIRTH MARKER.
0820 A780        STA  0,X+  PLACE BLUE MARKER.
0822 20E2        BRA  $806  GO CHECK FOR THE
0824           *END OF SCREEN.
0824 12          NOP
0825 12          NOP
```

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Program Listing

```
70 REM ***********************************************************************
80 REM *                                                                     *
90 REM *                                                                     *
100 REM*  VARIABLES FOR INPUT DESCRIPTION                                    *
110 REM*                                                                     *
120 REM*  X = LINE                                                           *
130 REM*  Y = COLUMN                                                          *
140 REM*  Z$ = INPUT FIELD                                                   *
150 REM*  C  = IF SET TO 1  -  NUMERIC INPUT                                 *
160 REM*  C(0) = IF SET TO 1  -  CHECK LENGTH OF INPUT FIELD                 *
170 REM*  C(1) = IF SET TO 1  -  CHECK FRACTIONAL POINT                       *
180 REM*  C(2) = IF SET TO 1  -  CHECK AMOUNT                                 *
190 REM*  C(3) = IF > 1       -  SPECIAL HANDLING                             *
200 REM*  L = MAXIMAL AMOUNT                                                 *
210 REM*  L(0) = MAXIMAL LENGTH OF INPUT FIELD                               *
220 REM*  L(1) = MINIMAL LENGTH OF INPUT FIELD                               *
230 REM*  L(2) = DIGITS AFTER FRACTIONAL POINT                               *
240 REM*  Z = NUMERIC INPUT IS STORED IN THIS VARIABLE                       *
250 REM*  A = IF SET TO 1  -  DISPLAY WITH EDIT                              *
260 REM*                                                                     *
270 REM***********************************************************************
280 CLS: CLEAR
290 DIM C(3): DIM L(2):
300 PRINT @(0,23), "INPUT DEMONSTRATION FOR MODELL II"
310 PRINT @(1,0), STRING$(80,"_")
320 PRINT @(2,45), "G. SCHWEIZER, 1100 VIENNA, AUSTRIA"
330 PRINT @(19,0), ""
340 INPUT "CONTINUE   (Y) :"; H$
350 PRINT @(20,0), CHR$(23)
360 IF H$= "N" THEN GOTO 1100
370 IF H$= "Y" OR H$= "" GOTO 390
380 GOTO 330
390 PRINT @(4,0), "01 SALESNUMBER :          ";
400 X=4: Y=25: C=1: C(0)=1: C(1)=1: C(3)=1: L(0)=6: LS=1: GOSUB 790
410 IF X1=1 GOTO 650
420 PRINT @(5,0), "02 PRODUCTNAME :          ";
430 X=5: Y=25: C(0)=1: L(0)=20: LS=2: GOSUB 790
440 IF X1=1 GOTO 650
450 PRINT @(6,0), "03 GROUP :                ";
460 X=6: Y=25: C=1: C(0)=1: C(1)=1: L(0)=2: LS=3: GOSUB 790
470 IF X1=1 GOTO 650
480 PRINT @(7,0), "04 PRICE :                ";
490 C$= " $": X=7: Y=25: A=1: C=1: C(1)=1: C(2)=1: L=100000: L(2)=2: LS=4: GOSUB 790
500 IF X1=1 GOTO 650
510 PRINT @(8,0), "05 MEASUREMENT :          ";
520 X=8: Y=25: C(0)=1: L(0)=5: LS=5: GOSUB 790
530 IF X1=1 GOTO 650
540 PRINT @(9,0), "06 SALES TAX :            ";
550 C$= " %": X=9: Y=25: C=1: A=1: C(2)=2: L=100: C(1)=1: L(2)=2: LS=6: GOSUB 790
560 IF X1=1 GOTO 650
570 PRINT @(10,0), "07 DISCOUNT :            ";
580 C$= " %": X=10: Y=25: A=1: C=1: C(2)=2: L=100: C(1)=1: L(2)=2: LS=7: GOSUB 790
590 IF X1=1 GOTO 650
600 PRINT @(11,0), "08 SUPPLIER :            ";
610 X=11: Y=25: C(0)=1: L(0)=20: LS=8: GOSUB 790
620 IF X1=1 GOTO 650
630 PRINT @(12,0), "09 MIN. IN STOCK ::      ";
640 C$=" "+P$(5): X=12: Y=25: C=1: C(1)=1: C(2)=1: L=100000: L(2)=2: A=1: GOSUB 790
650 PRINT @(19,0), ""
660 H$=""
670 INPUT "DATA OK  (Y) :"; H$
680 IF H$= "Y" OR H$= "" THEN GOTO 280
690 IF H$= "N" THEN GOTO 710
700 GOTO 650
710 PRINT @(19,0), ""
720 INPUT "LINE NUMBER       :"; X0
730 PRINT @(20,0), CHR$(23)
740 X1=1
750 ON X0 GOTO 400,430,460,490,520,550,580,610,640,710
760 REM ***********************************************************************
```

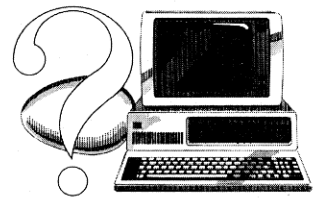
Listing continues

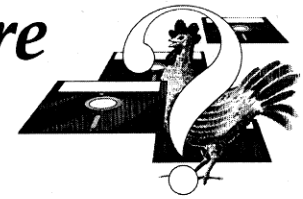
Did you ever enter an alphanumeric character when numeric input was required and have something in the first line of your readout you wanted to keep? If you try it, the program crashes and the computer commands you to Redo From Start. With this input subroutine, you can specify all input parameters by setting some variables. The computer clears all variables at the end of the subroutine. Further, there is no question mark before input and you can edit each input.

The best way to master the program is to type and run it. The examples illustrate its use; alter the program to fit your needs. Remember the variables listed at the beginning of the program; incorporate your changes so you do not forget them.

The input subroutine is in lines 790–990. The line input statement in line 790 allows alphanumeric input with no preceeding question mark. The cursor postion depends on X and Y.

Which comes first...the software or the hardware





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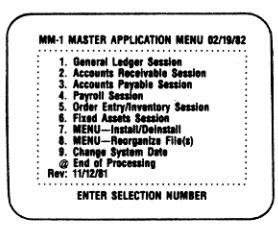

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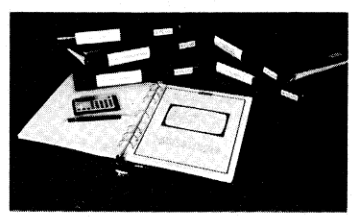

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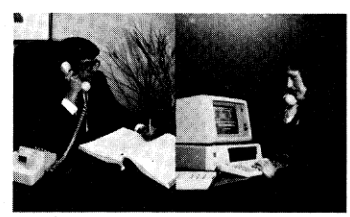

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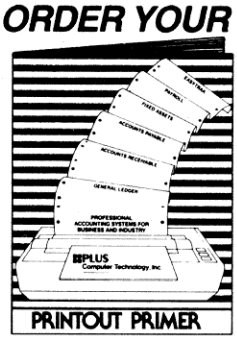

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Lines 800 and 810 check the input: If C is set to 1 the input moves to the numeric field Z. If you input a non-numeric character the length of Z and Z$ and it is not equal the program jumps to the error subroutine. Any key clears the input and you can try again.

Line 830 compares the length of Z with L(0) and L(1). Lines 850–880 check the digits after the decimal point. A statement like A# = ABS(A# – FIX(A#)) would be easier but produces truncation errors. The test counts the characters from right to left to a decimal point. Increase line 850 for more than 12 digits after the decimal point.

If C(2) is set to 1 I check the amount in line 900. If A = 1 I jump to line 950 and display with Edit.

Special Handling

The special handling variable C(3) stores input in the right variable. For LS = XX, store your input with F(LS) = Z or LSET P$(LS) = Z$. Write your own subroutines to check for a record with the same key value or to write a record. In the Listing all jumps are made to 930 (see line 920). If C(3)>1 you can jump to your own coded subroutine. Remember to return with GOTO 930.

After all inputs the computer asks if the data is okay. If your answer is Yes press Enter; otherwise type N and then the line number question will appear. Change any input; depending on LS in each input statement, variables change to their new value.

Write programs with multiple inputs and a mask on the screen. Store my routine in one file and edit it to write a new program.■

Listing continued

```
770 REM ********************** I N P U T ********************************
780 REM *********************************************************************
790 PRINT @(X,Y), "";: LINE INPUT Z$
800 IF C=1 THEN LET Z=VAL(Z$)
810 IF C=1 AND LEN(Z$)<>LEN(STR$(Z))-1 THEN GOTO 1030
820 IF C(0)=0 THEN GOTO 840
830 IF LEN(Z$)<=L(0) AND LEN(Z$)>=L(1) THEN GOTO 840ELSE GOTO 1030
840 IF C(1)=0 THEN GOTO 890
850 FOR W=1 TO 12
860 X$=RIGHT$(Z$,W)
870 IF LEFT$(X$,1)= " " AND W>L(2)+1 THEN GOTO 1040
880 NEXT W
890 IF C(2)=0 THEN GOTO 910
900 IF Z<L THEN GOTO 910ELSE GOTO 1030
910 IF A=1 GOTO 950
920 ON C(3) GOTO 930,930,930
930 K=0: C=0: C(0)=0: C(1)=0: C(2)=0: C(3)=0: L=0: L(0)=0: L(1)=0: L(2)=0:
940 RETURN
950 PRINT @(X,Y), CHR$(23);
960 PRINT @(X,Y), USING "##########.##"; Z;
970 PRINT C$
980 A=0
990 GOTO 920
1000 REM ******************************************************************
1010 REM ***************  ERRORDESCRIPTION TABLE  ************************
1020 REM ******************************************************************
1030 PRINT @(20,35), "MIN/MAX. ERROR": GOTO 1060
1040 PRINT @(20,35), "ERROR FRACTIONAL POINT": K=0: GOTO 1060
1050 PRINT @(20,35), "ONLY NUMERIC INPUT": GOTO 1060
1060 H$=INPUT$(1)
1070 PRINT @(20,0), CHR$(23)
1080 PRINT @(X,Y), STRING$(25," ")
1090 GOTO 790
1100 PRINT @(21,0), "END OF THE DEMONSTRATION PROGRAM,   THANK YOU"
1110 END
```


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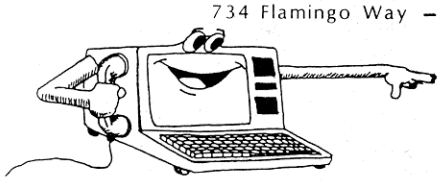

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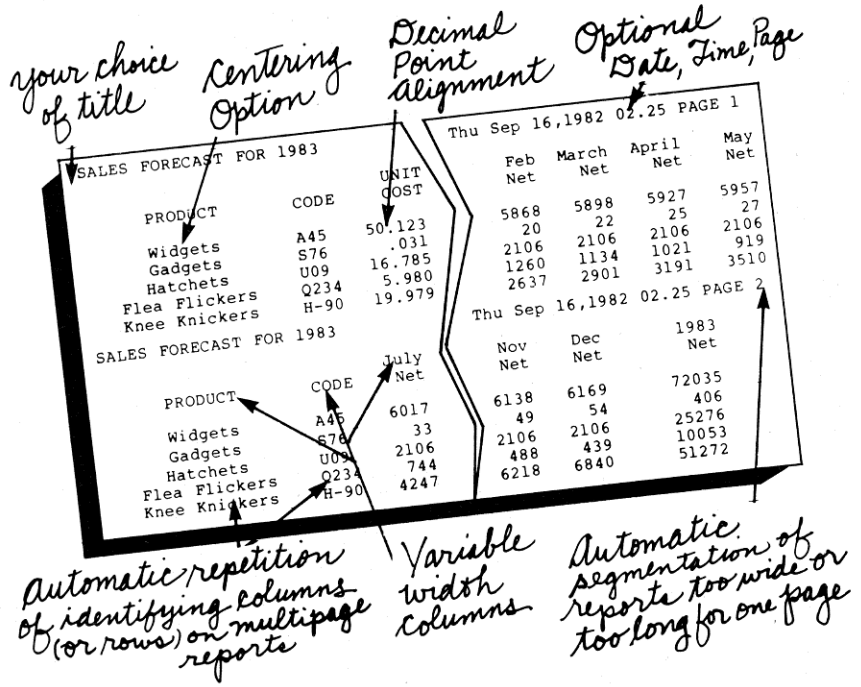

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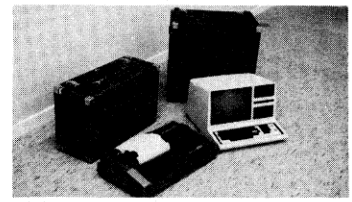

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Concatenate your programs on tape.

Color Computer Merge

John Heusinkveld
2161 E. Gerrado Brio
Tucson, AZ 85718

Mergers are popular in business these days. This program lets Extended Basic Color Computer users join the fun. This program concatenates 2-10 programs saved on tape in the order they appear on tape and saves the resulting program so you can CLOAD and run it. Radio Shack does not provide any method for merging programs saved on tape on the Color Computer, although Color Disk Basic contains a Merge command. Unless you have the money for a disk drive, however, this will not help you.

Since my bank balance wasn't quite that healthy, I decided to write my own merge utility. I experimented with various CSAVEMs and CLOADMs, but all I could do was make the computer hang up.

Finally, I discovered that programs saved in ASCII format can be accessed line by line from tape using INPUT #−1. I also found that properly formatted data files can be loaded as programs. Using these two bits of information, I created a simple program that concatenates two programs by reading them into a string array, and then writing that array to tape. I later rewrote the program to accommodate up to 10 files (see the Program Listing).

How To Use Merge

Save all of the programs to be merged on tape in the order they are to appear in the final listing, using CSAVE "file name", A. Neither Radio Shack manual covers the A option for CSAVE; it saves a program on tape as a string data file so that each line appears as one string. You can CLOAD this and other text files as if they were programs, although they require more tape and take longer to load.

Next, CLOAD and run Merge. The program will ask for the number of programs to be merged and the file name of each. Be sure that none of the programs have overlapping line numbers, as this will cause errors. The program will also ask for the file name under which you want to save the final copy. After you have given all this information, the message "Ready Cassette" appears. Press the play button on the cassette recorder and press enter. The cassette should begin alternately starting and stopping until it has loaded all of the programs (they are listed to the screen as they are loaded).

When it has finished, the computer will display "Rewind". Rewind your cassette or place a new one in the recorder and press enter. The computer will tell you to press record. Do so and press enter again. The cassette will go on and the merged programs will be saved as one under the file name you gave.

Finally, load this program and make any modifications you wish, and then save it without the A option to speed loading.

Merge should not introduce any errors into your program, with the exception that some programs, especially those which use many read and data statements, may behave differently when combined with others. You will have to work these bugs out of your programs, but be reassured that they do not appear too often. The other, more serious problem is the memory limitation: In a 16K system, the maximum size for the array is about 850. I wrote this program on a 32K machine; 16K users will have to change line 5 to read 5 CLS:PCLEAR1: CLEAR 10000:DIML$(850). If you run out of memory, you will get an error; I did not protect against this because doing so wastes precious RAM. ■

```
10 CLS:PCLEAR1:CLEAR20000:DIML$(1700)
20 PRINT"MERGE":PRINT"BY JOHN HEUSINKVELD":PRINT"10/1/81"
30 INPUT"HOW MANY FILES TO BE MERGED";NF
40 FORF=1TONF:PRINT"FILE #"F":";:LINEINPUTFT$(F):NEXTF
50 LINEINPUT"NEW FILE NAME :";NN$:LINEINPUT"READY CASSETTE";P$
60 FORD=1TONF:OPEN"I",-1,FT$(D)
70 LINEINPUT#-1,L$(X):PRINTL$(X):X=X+1
80 IFNOTEOF(-1)THEN70
90 CLOSE:NEXTD
100 LINEINPUT"REWIND";P$:LINEINPUT"PRESS RECORD";P$
110 OPEN"O",-1,NN$:FORD=0TOX:PRINT#-1,L$(D):NEXTD:CLOSE
120 PRINT"FILES ";:FORS=1TONF:PRINTFT$(S)",";:NEXTS:PRINTCHR$(8)" MERGED INTO "NN$
130 END
```

Program Listing

The Key Box

Color Computer
32K RAM
Extended Color Basic

STOPPER!

The BASIC Breakpointer
By Roxton Baker
Author of "TRAKCESS"

Stopper is a unique machine language utility for debugging your BASIC programs on a Level II or Disk BASIC Model I or III.

Some of Stopper's many commands allow you to:

- Single step next instruction or line in full
- Determine exactly where an error occured
- Set powerful BASIC breakpoints
- STOP when variable is UNEQUAL to a value
- STOP when variable is EQUAL to a value
- Trace a variable value to screen or printer
- Pause, slow-step and single step
- Selectively execute statements and lines

These examples will show how easily STOPPER is used:

Break when line 100 is hit for the 5th time	<100,5
Break when X! is equal to 10	<X=10
Break when ST$ in NOT equal to "YES"	<ST$<>"YES"
Execute next statement or full line	+ or >
Exact statement where program halted	P

With STOPPER you will know exactly where the error is and why it occurred. Program execution is under YOUR control! Stopper is self-relocating in high memory and respects any high memory utilities.

A special offer from the author and TAS: Stopper is $20 on tape or disk, BUT you are licensed to make up to four additional copies, making the cost for this valuable utility only $4. Support co-op purchases by ordering today. BASIC debugging will never be easier, nor a better utility any cheaper. Up to four extra manuals can be purchased for $1 each and Z80 source code is available (refer to manual).

Tape Users: LOOK!

MAILing MANager

This combination Z80/BASIC program has over 18 commands that allow you to effectively manipulate your mailing list using a cassette based Model I and III. All commands are described fully in an excellent manual. MAILing MANager supports mailing labels (your choice of formats), file sorting (in fast Z80), searching on your choice of fields (with output going to screen or printer), two types of cassette data input/output:

1. a faster cassette I/O on both Model I and III for minimum cassette saving and loading time, and
2. BASIC I/O routines for compatibility with other programs.

MAILing MANager also allows easy maintenance of file data with deletion and editing commands. The MAILing MANager manual also includes "Programming Notes" in case you want to modify the screen or printer output. Note that this is NOT required. MAILing MANager supports about 60 names on a 16K machine, 398 on a 48K machine. MAILing MANager respects high memory if you are using another high memory driver (for lower case, printer, etc.). MAILing MANager is available on cassette, complete with documentation for $29.95.

TCOM: Tape Communications

TCOM is an extremely advanced utility for telecommunications on a tape based Model III. Just look at the features: full uploading and downloading, automatic printer buffer, read ANY tape at high or low baud, automatic open/close buffer, user-definable buffer size, view buffer contents, host mode, and more. TCOM will not interfere with BASIC - you can jump to BASIC without interfering with TCOM buffers, and back to TCOM without destroying your BASIC program. If TCOM is being used at both computers, a BASIC memory to BASIC memory transfer is possible! Many more features - ask for info sheet. Works at half or full duplex, up to 9600 baud. TCOM is $29.95 or get two TCOM packages for $50.00 - save $9.95!

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There is much to tell you about this powerful new utility for the Model III. We'll start by telling you it is the ONLY commerical utility that will allow you to accurately write and manipulate mixed density tracks and zap sectors larger than 256 bytes (seems there are more and more appearing on the marketplace). We suggest that you request our information sheet on this powerful utility. All SASE's will be returned the day we receive them, or check our bingo number. TRAKCESS is available for Model III and Model I SINGLE DENSITY only at the time of this writing. Model III TRAKCESS is $29.95 and Model I TRAKCESS is $24.95.

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✓69

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Transmuter

by Jon Mark O'Connor

Sometimes, you just have to relabel a program's variables. When you do, merge the program with Transmuter; relabelling will be a breeze.

Transmuter lets you relabel your variables. Normally, you wouldn't relabel them for personal use. But, if you write for a computer magazine, your variables must make sense. For example, instead of using ZS to represent car payment, you should use CP.

Transmuter uses a PEEK and POKE approach, and it can change almost any combination of letters and numbers within a program. Changing mathematical signs (+ - / *) is more difficult, but you can do it. Transmuter can also give you a list of all your variables and can show you the location of any token in your program, as well as send these lists to your printer.

Transmuter also contains a spot-checking function that lets you scan the lines, and upon reaching the desired variable, gives you the option to change it. If you hit Y to change it, the change appears on the screen. If you respond N, the scan continues.

Label changes must be identical in length to the original label. Transmuter has a low-level interpretive algorithm for the change. For instance, Transmuter doesn't know if you DEFSTR A at the top of your program. If you indicate A$ for change, it won't change a single A. This isn't a drawback, however, because you can change all As later.

Transmuter treats labels as separate entities. Once a matching label is found, the change occurs. If you want to

Program Listing

```
62000 CLEAR3000:DEFINTC-Y:DEFSTRB,Z
62001 DIMG%,L%,TN%,YY%,X%,OZ%,SC$,TZ%,Y!,WZ%,OY%,OX%,RR%,OO%
62002 DIMSP$,LL!,TN$,J%,Z9$,Z8$,Z7$,OZ$,XP%,XR!,Z1$,PZ$,FL!
62003 DIMLL$,B9$,FL$,Z6$,ZL$,ZZ$,BJ$,PZ%,SS%,QM%,PY%,PX%,GJ%
62004 DIMQS$,T%,B$(125):CLS:GOTO62072
62005 '%&%&%&%&%&%&%&%&%& VARIABLE CHANGE AND SEARCH %&%&%&%&%&%
&%&%&%&%&%&%&%&%&
62006 X=PEEK(X)+PEEK(X+1)*256
62007 Y!=PEEK(X+2)+PEEK(X+3)*256:IFY!=>LL!ENDELSEWZ=0
62008 PRINTUSINGZ1;Y!,:FORG%=X+4TOX+255
62009 IFPEEK(G%)=147ORPEEK(G%)=0THEN62006ELSEIFPEEK(G%)=34GOSUB6
2032
62010 IFPEEK(G%)=>128NEXT
62011 ONTZGOTO62012,62016,62017,62015
62012 IFRR=0THEN62014
62013 IFPEEK(G%)=>65ANDPEEK(G%)<=90GOSUB62019:LPRINTZ7;ELSENEXT
62014 IFPEEK(G%)=>65ANDPEEK(G%)<=90GOSUB62019:PRINTZ7;ELSENEXT
62015 IFPEEK(G%)=OZANDPEEK(G%+1)=OYANDPEEK(G%+2)=OXPOKEG%,PZ:POK
EG%+1,PY:POKEG%+2,PX:GOSUB62019:PRINTZ7;:NEXTELSENEXT
62016 IFPEEK(G%)=OZANDPEEK(G%+1)=OYPOKEG%,PZ:POKEG%+1,PY:GOSUB62
019:PRINTZ7;ELSENEXT
62017 IFPEEK(G%)=OZPOKEG%,PZ:GOSUB62019:PRINTZ7;:NEXT
62018 NEXT
62019 IFWZ=0ANDRR=999LPRINTCHR$(13)TAB(0)USINGZ6;Y!;
62020 IFRR=999LPRINTUSING"%%";CHR$(PEEK(G%));:G%=G%+1:WZ=WZ+1ELS
EPRINTCHR$(PEEK(G%));:G%=G%+1:WZ=WZ+1
62021 IFPEEK(G%)=0THEN62006ELSEIFPEEK(G%)=>65ANDPEEK(G%)<=90THEN
62020
62022 IFPEEK(G%)=40OO=999:GOTO62020ELSEIFPEEK(G%)=44ANDOO=0RETUR
N
62023 IFPEEK(G%)=41OO=0:GOTO62020ELSEIFPEEK(G%)=34GOSUB62032:GOT
O62020
62024 IFRR<>999THEN62029
62025 IFPEEK(G%)=41ANDOO=999:LPRINTCHR$(41);:OO=0:RETURN
62026 IFOO=999ANDPEEK(G%)=>128LPRINTB(PEEK(G%)-128);" ";:G%=G%+1
:GOTO62020
62027 IFPEEK(G%)=>32ANDPEEK(G%)<=57THEN62020ELSERETURN
62028 RETURN
62029 IFOO=999ANDPEEK(G%)=>128PRINTB(PEEK(G%)-128);:G%=G%+1:GOTO
62020
62030 IFPEEK(G%)=>32ANDPEEK(G%)<=57THEN62020ELSERETURN
62031 RETURN
62032 G%=G%+1:IFPEEK(G%)=0THEN62006ELSEIFPEEK(G%)=34THENRETURNEL
SE62032
62033 '#&#&#&#&#&#&#&#&#&#&# SPOT CHECKING SECTION #&#&#&#&#&#&#
&#&#&#&#&#&#&#&#&
```

Listing continues

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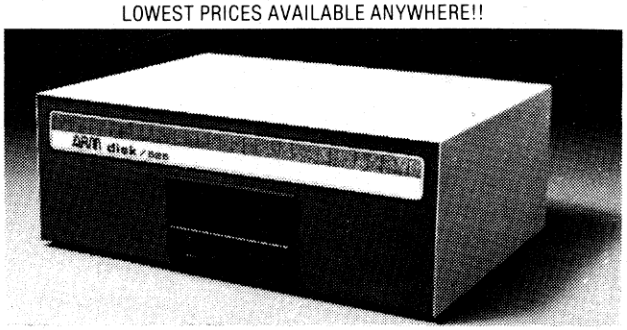

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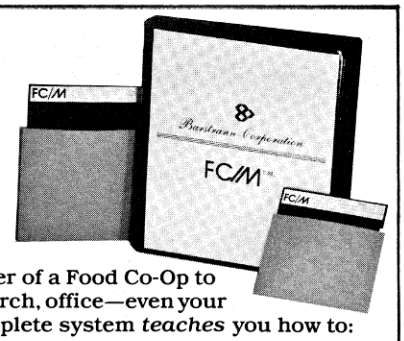

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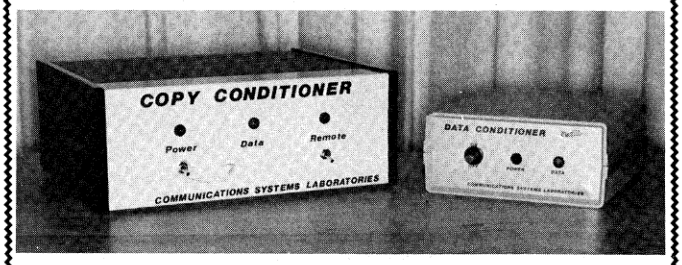

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change a one-character label, the program scans until it finds the character and then continues. If you have:

```
AAA
 BA
  A
```

the subsequent change will be:

```
XAA
 BX
  X (change A to X)
```

Array counters are protected. If you have the label A(A) in your program, the first A will be changed. If you go through the program a second time and indicate A for change, the protected A in parentheses will be changed since it is the first occurrence of the letter.

"Array counters are protected."

Change all two- or three-character labels first. As in the above array, A(A), here are the possibilities:

```
A(A
(A)
A(
A)
```

If you have something like this:

```
AAA(B-2)
```

you could indicate:

```
AAA
AA(
A(B
2)
AA
A(
(B
```

So, even though you cannot touch the minus sign or change it directly, you do have other options.

To change numbers, you could, for example, make all PRINT@960s change to PRINT@320s by either indicating:

960 to 320
or
@96 to @32

Be careful when changing numbers,

Listing continued

```
62034 PRINT@704,STRING$(5,255)CHR$(196);
62035 X=PEEK(X)+PEEK(X+1)*256
62036 Y!=PEEK(X+2)+PEEK(X+3)*256:IFY!=>LL!THENEND
62037 PRINT@704,USINGZ9;Y!;:FORL%=X+4TOX+255
62038 IFPEEK(L%)=147ORPEEK(L%)=0THEN62041
62039 IFPEEK(L%)>127ANDPEEK(L%)<251PRINTB(PEEK(L%)-128);:NEXT
62040 PRINTCHR$(PEEK(L%));:NEXTELSENEXT
62041 YY=710:PRINT@YY,;:FORL%=X+4TOX+255:IFPEEK(L%)=34GOSUB62058

62042 IFPEEK(L%)=147ORPEEK(L%)=0THEN62034ELSEIFPEEK(L%)<>OZTHEN6
2047ELSEQM=LEN(OZ$)
62043 ONQMGOTO62046,62045,62044
62044 IFPEEK(L%)=OZANDPEEK(L%+1)=OYANDPEEK(L%+2)=OXTHEN62049ELSE
62047
62045 IFPEEK(L%)=OZANDPEEK(L%+1)=OYTHEN62049ELSE62047
62046 IFPEEK(L%)=OZTHEN62049
62047 IFPEEK(L%)>128ANDPEEK(L%)<251YY=YY+LEN(B(PEEK(L%)-128)):NE
XT
62048 YY=YY+1:NEXTELSENEXT
62049 FORT=1TO20:NEXT:PRINT@YY,STRING$(LEN(BJ),191);:FORT=1TO20
62050 NEXT:PRINT@YY,BJ;:QM=LEN(BJ):PRINT@960,CHR$(200);
62051 PRINT@980,"CHANGE <Y OR N>";:QS$=INKEY$
62052 IFQS$="Y"THENGOSUB62054:PRINT@960,"OKAY";:YY=YY+QM:L%=L%+Q
M:GOTO62042
62053 IFQS$="N"THENYY=YY+QM:L%=L%+QM:GOTO62042ELSE62049
62054 IFLEN(BJ)=3POKEL%,PZ:POKEL%+1,PY:POKEL%+2,PX:PRINT@YY,PZ$;
:RETURN
62055 IFLEN(BJ)=2POKEL%,PZ:POKEL%+1,PY:PRINT@YY,PZ$;:RETURN
62056 POKEL%,PZ:PRINT@YY,PZ$;:RETURN
62057 GOTO62049
62058 L%=L%+1:YY=YY+1:IFPEEK(L%)=0THEN62034
62059 IFPEEK(L%)=34THENRETURNELSE62058
62060 '$&$&$&$&$&$&$&$&$&$&$&$& TOKEN LOCATION $&$&$&$&$&$&$&$&$
&$&$&$&$&$&$&$&$&$&
62061 LPRINTZZ;TN$:GOTO62063
62062 X=PEEK(X)+PEEK(X+1)*256
62063 Y!=PEEK(X+2)+PEEK(X+3)*256:IFY!=>LL!ORX=0END
62064 FORG%=X+4TOX+255:IFPEEK(G%)=0THEN62062
```

Listing continues

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Listing continued

```
62065 IFPEEK(G%)=TNLPRINTUSINGZ9;Y!;:GOTO62062ELSENEXT
62066 X=PEEK(X)+PEEK(X+1)*256
62067 Y!=PEEK(X+2)+PEEK(X+3)*256:IFY!>LL!PRINTZL:END
62068 PRINTTAB(16)USINGZ8;Y!;:FORG%=X+4TOX+255
62069 IFPEEK(G%)=0THEN62066
62070 IFPEEK(G%)<>TNNEXTELSEPRINTUSINGZ9;Y!;:GOTO62066
62071 '!#!#!#!#!#!#!#!#!#!#!  INPUT SECTION  !#!#!#!#!#!#!#!#!
#!#!#!#!#!#!#!#!#!
62072 RESTORE:CLS:XP=PEEK(16548)+PEEK(16549)*256:GOSUB62115
62073 PRINT@468,"READING YOUR DATA....."
62074 READB9:IFB9="***"THEN62075ELSE62074
62075 GOSUB62120:CLS:PRINT@448,:INPUT"FIRST LINE NUMBER";FL$
62076 FL!=VAL(FL$):GOTO62078
62077 XP=PEEK(XP)+PEEK(XP+1)*256
62078 XR!=PEEK(XP+2)+PEEK(XP+3)*256:PRINT@531,USINGZ9;XR!;
62079 IFXR!=>FL!ORXR!=62000THEN62080ELSE62077
62080 X=XP:PRINT@512,:INPUT"LAST  LINE NUMBER";LL$
62081 IFLL$="-"THENLL!=61999:GOTO62086ELSELL!=VAL(LL$)
62082 IFLL!<FL!THEN62080ELSE62084
62083 XP=PEEK(XP)+PEEK(XP+1)*256
62084 XR!=PEEK(XP+2)+PEEK(XP+3)*256:PRINT@595,USINGZ9;XR!;
62085 IFXR!=>LL!ORXR!=62000THEN62086ELSE62083
62086 LL!=LL!+1:PRINT@345,"TRANSMUTER"
62087 PRINTTAB(20)"BY JON MARK O'CONNOR":PRINTSTRING$(63,61)
62088 PRINT@512,CHR$(13)"CHANGE ANY VARIABLE UP TO 3 CHARACTERS"

62089 PRINTCHR$(13)"PRINT ALL VARIABLES/STRING$S HIT ** "
62090 PRINTCHR$(13)"TO FIND ANY TOKEN HIT TOK"
62091 RR=0:PRINT@896,:INPUT"CHANGE WHAT VARIABLE";OZ$
62092 IFOZ$="TOK"THEN62093ELSE62096
62093 PRINTSTRING$(16,13):INPUT"TOKEN NAME";TN$:FORJ=0TO122
62094 IFTN$=B(J)GOSUB62111:GOTO62095ELSENEXT:GOTO62093
62095 TN=J+128:PRINT@976,ZZ;TN$:IFRR=999THEN62061ELSE62067
62096 IFOZ$="**"THENTZ=1:RR=999:CLS:PRINT@970,"ALL VARIABLE NAME
S, STRING$, ARRAYS, ETC":GOSUB62111:GOTO62007
62097 IFLEN(OZ$)>3THEN62091ELSEIFOZ$=""THEN62091ELSEBJ=OZ$
62098 OZ=ASC(LEFT$(OZ$,1)):IFLEN(OZ$)=1TZ=3:GOTO62101
62099 IFLEN(OZ$)=2OY=ASC(MID$(OZ$,2,1)):TZ=2:GOTO62101
62100 OY=ASC(MID$(OZ$,2,1)):OX=ASC(MID$(OZ$,3,1)):TZ=4
62101 PRINT@832,:PRINT"CHANGE "OZ$" TO WHAT";:INPUTPZ$
62102 IFPZ$=""THEN62101ELSEIFLEN(PZ$)<>LEN(OZ$)THEN62101ELSECLS
62103 PRINT@980,"CHANGING "OZ$" TO "PZ$:PZ=ASC(LEFT$(PZ$,1))
62104 IFLEN(PZ$)=1THEN62107
62105 IFLEN(PZ$)=2PY=ASC(MID$(PZ$,2,1)):GOTO62107
62106 PY=ASC(MID$(PZ$,2,1)):PX=ASC(MID$(PZ$,3,1))
62107 PRINTTAB(10)"WOULD YOU LIKE TO SPOT CHECK (Y OR N)";
62108 SC$=INKEY$:IFSC$="N"THENPRINT@960,CHR$(31);:GOTO62007
62109 IFSC$="Y"SS=999:PRINT@960,CHR$(31);:PRINTSTRING$(6,13):GOT
O62036ELSE62108
62110 GOTO62108
62111 PRINT@980,"<P>RINTER <S>CREEN";
62112 SP$=INKEY$:IFSP$=""THEN62112
62113 IFSP$="P"RR=999:PRINT@960,CHR$(31);:RETURN
62114 IFSP$="S"RR=00:PRINT@960,CHR$(31);:RETURNELSE62112
62115 Z7=CHR$(32)+CHR$(95)+STRING$(2,32)
62116 Z6=CHR$(13)+"#####"+CHR$(45)+STRING$(4,95)+CHR$(32)
62117 Z9="##### ":Z8=STRING$(6,8)+Z9:ZL=STRING$(6,8)+"END"
62118 Z1=CHR$(13)+Z9
62119 ZZ="THE FOLLOWING LINES CONTAIN ":RETURN
62120 FORG=0TO122:READB(G):NEXT:RETURN
62121 DATA"***",END, FOR, RESET, SET, CLS, CMD, RANDOM, NEXT, DA
TA
62122 DATA INPUT, DIM, READ, LET, GOTO, RUN, IF, RESTORE, GOSUB
62123 DATA RETURN, REM, STOP, ELSE, TRON, TROFF, DEFSTR, DEFINT
62124 DATA DEFSNG, DEFDBL, LINE, EDIT, ERROR, RESUME, OUT, ON
62125 DATA OPEN, FIELD, GET, PUT, CLOSE, LOAD, MERGE, NAME, KILL

62126 DATA LSET, RSET, SAVE, SYSTEM, LPRINT, DEF, POKE, PRINT
62127 DATA CONT, LIST, LLIST, DELETE, AUTO, CLEAR, CLOAD, CSAVE
62128 DATA NEW, TAB(, TO, FN, USING, VARPTR, USR, ERL, ERR, STRI
NG$
62129 DATA INSTR, POINT, TIME$, MEM, INKEY$, THEN, NOT, STEP,+,-
,*
62130 DATA/, [, AND, OR,>,=,<, SGN, INT, ABS, FRE, INP, POS, SQR

62131 DATA RND, LOG, EXP, COS, SIN, TAN, ATN, PEEK, CVI, CVS
62132 DATA CVD, EOF, LOC, LOF, MKI$, MKS$, MKD$, CINT, CSNG
62133 DATA CDBL, FIX, LEN, STR$, VAL, ASC, CHR$, LEFT$, RIGHT$,
MID$
62134 END
62135 '()()()()()()()()()()()()() 5712 METHOD ()()()()()()()()()()
()()()()()()()()()()()
62136 K=-1:FORG%=5712TO6175
62137 IFPEEK(G%)>127:K=K+1:B(K)=B(K)+CHR$(PEEK(G%)AND127)ELSEB(K
)=B(K)+CHR$(PEEK(G%))
62138 NEXT:RETURN
```

because you might inadvertently change that one POKE that will send your computer into the void of no return. Always check the accuracy of the numbers.

The Program

After a data search by Transmuter, you'll be asked for the first line number of your program. If you enter 2, but your program begins with line 10, Transmuter will begin at line 10. The last line number can be entered as a specific line or you can hit the hyphen, which will take you to the end of your program.

The menu requests that you either insert any variable for change (up to three characters) or hit ** to see a listing of all your variables/ STRING$, or hit TOK for a token search. After a variable change request, you are prompted to tell what change you wish to make. You can then select spot-checking. If you don't desire spot-checking, you will see the line numbers followed by the variable, if it's in the line.

"After a variable change request, you are prompted to tell what change you wish to make."

If you select TOK, you can request any token. Remember that the math signs are also tokens. A frequently used sign, the equal sign, will produce furious action to either the screen or printer.

To eliminate data lines, I have included the 5712 method at the end of the listing. If you would rather use this than type in the data lines, change the first GOSUB in line 62075:

```
62075  GOSUB 62136.....end of line
```

The data read takes .96 seconds. The 5712 method takes 14 seconds, and this wait time could become significant.

Merge Transmuter with your program in the normal manner. ■

Jon Mark O'Connor lives at 56 Eustis Parkway, Waterville, ME, 04901.

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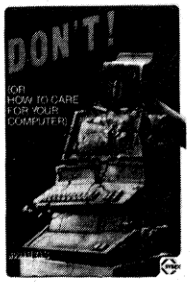

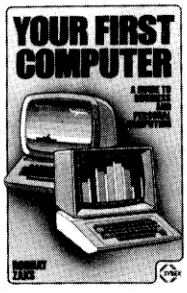

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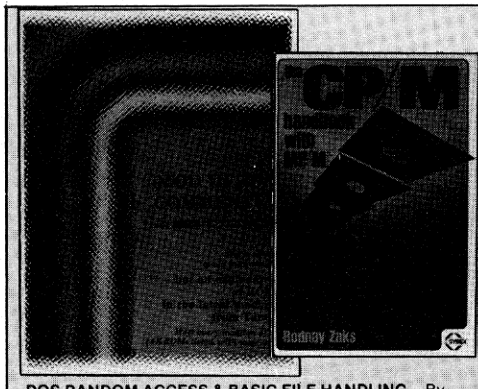

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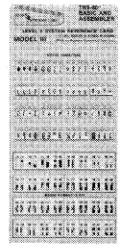

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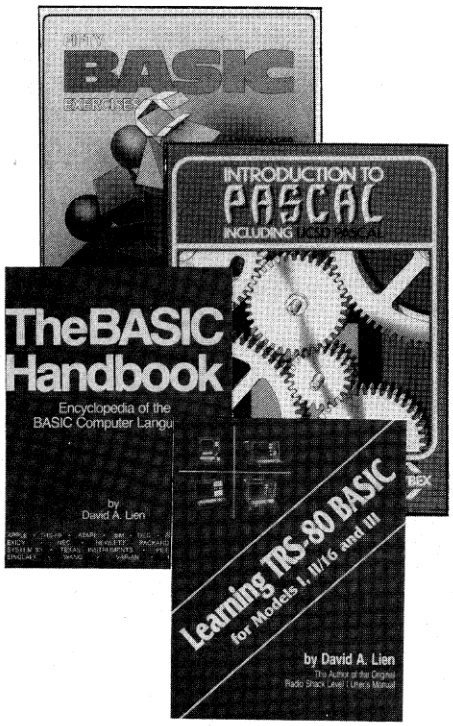

THE BASIC HANDBOOK—SECOND EDITION—by David Lien. This book is unique. It is a virtual ENCYCLOPEDIA of BASIC. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the HANDBOOK comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. BK1174 $19.95.*

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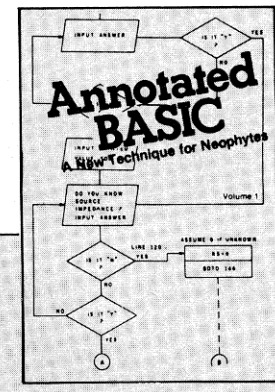

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NEWS THIS MONTH

ISAAC ASIMOV TALKS ABOUT FUTURE
The famed science fiction author offers his views on the future impact of computers.
PAGE 346

MAJOR LEAGUE REPAIR OF MICROS
A company named TRW has started a pilot program in Dallas that might grow into something big.
PAGE 348

CUSTER PORN ATTACKED
American Indians and women's groups have blasted a California video-game maker for "settling an old score" for the former head of the 7th Cavalry.
PAGE 354

SOFTWARE

Head pat or patronizing bone?

Tandy recognizes outside softwriters but everyone isn't jumping for joy.

Some computer cowboys will be bunking at Tandy's ranch under a program started last October to help independent writers of TRS-80 software.

According to published reports, the Fort Worth firm's Outside Software Support Program will provide independents with:

- Marketing and technical assistance;
- Possible inclusion in a software referral guide sold through Radio Shack stores; and
- Access to TRSDOS and its source code.

The program is Radio Shack's first attempt to provide help to software writers outside Tandy, or who are not writing for in-store sales.

Is the program a big departure from the past? "I would say it is," observed Computer Merchandising Director Ed Juge. "It is a method to allow us to reach vertical markets that are very definitely good markets but which we are not capable of adequately servicing."

Vertical markets, he explained, include software for lawyers, doctors, dentists, print shops, and parts stores.

But is the program for all independents? That question's answer is fuzzy. And that's stirred suspicion of the program among some prominent TRS-80 software writers.

Asked if Tandy would screen out of the program's referral guide software competing with Tandy's, Juge told *80 Micro*, "The whole point of doing this is to make software available for vertical market applications that we simply can't make available and don't have the expertise to sell and properly demonstrate if we did make them available."

Although Vice President for Computer Merchandising Jon Shirley echoed Juge's remarks, he widened the opening in the corral gate. "We're not very interested in marketing to vertical industries, for example," he told *Computer Business News*. "But there's a lot of TRS-80 software out there for vertical markets, and we want to help those people. It's not limited to vertical market software, though."

"I just think Tandy is just trying to throw a bone to the turkeys," one large software maker said privately. "I have an opinion that it's playing a game, but I don't have any foundation on which to base that other than I distrust Tandy implicitly."

"We were unimpressed with their announcement," said Bob Snapp, head of Snappware in Cincinnati, OH. "We don't feel it is a great step forward for software authors. And we don't intend to participate in the program."

Apparat Inc. will be submitting software to Tandy for review, but it has low expectations. The Denver, CO, company's best seller, NEWDOS80, competes with Tandy's operating system, TRSDOS, and its annointed system, LDOS, made by Logical Systems Inc. in Mequon, WI.

Jason Matthews, Apparat's manager of software research and development, noted, "Tandy's not going to ask us to do anything with our operating system because it will blow LDOS out of the water."

Another maker of software competing with Tandy's questioned the program. The maker, who requested anonymity, said the "theory" behind the the program failed to meet the practice.

Interviewed about two weeks after Tandy announced the program, the maker observed, "Right now this looks like it was a press announcement rather than something substantial."

He found the documentation for the program disappointing. "Not one word was in there about Tandy reviewing or recommending software," he said. "What was in there was they'd provide us with information about entrance points into the ROM and how to do a fast INKEY$ and other really wonderful tidbits of information that were available to the hobby clubs three years ago. But the hobby clubs had a helluva lot more detail than Tandy was willing to give today."

Jim Mendenhall, general manager of

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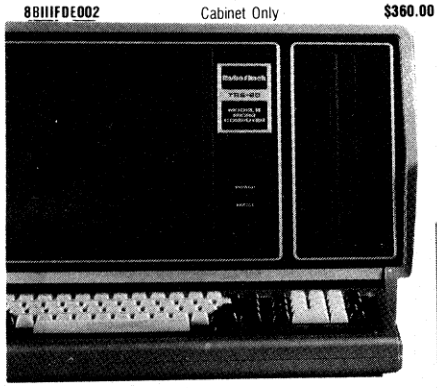

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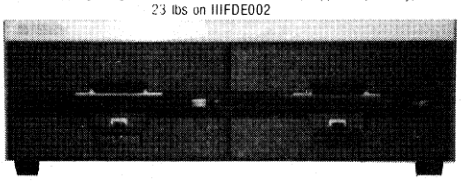

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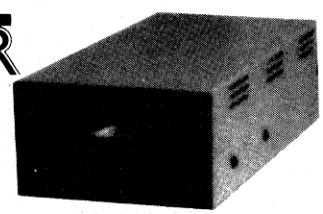

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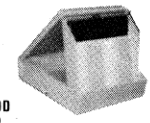

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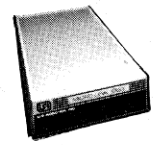

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the Cornsoft Group in Indianapolis, IN, was skeptical of the value of the program's referral guide. He said Tandy currently distributes a "source book" with listings of independent software makers. The makers pay $10 to be listed in the book.

"People are going to be leary of a buyer's guide—especially if it turns out like the Source Book," he said. "It didn't really tell you anything. It was still a buyer beware sort of thing. Most people are not comfortable dealing in that kind of situation."

He sees the Color Computer market benefiting most from the program.

"I think it has the potential to help Color Computer authors much more than it does the Model I and III authors," he said. "New Color Computer owners are more dependent on Radio Shack for software than Model I and III owners are. The I and III owners are familiar with the independent sources to buy software—software only stores, consumer magazines and that kind of thing."

Dan Nelson, general manager of Nelson Software in Minneapolis, MN, said his enterprise has submitted several of its Color Computer programs to Tandy for review.

"I think it's about time Tandy pursued third-party vendors," he noted. "Third-party vendors usually cover a specific application in greater detail and are able to provide better support to their customers than Tandy has been able to offer."

Nelson said Tandy prepared a software-maker source book last June for distributors of its Color Computer clone, the TDP-100. That listing resulted in a number of distributor inquiries about Nelson's products, but no sales yet.

"The local distributor came in and viewed the software," Nelson said. "He was really interested in games. Apparently, he hasn't landed enough accounts to buy any from us."

He added, "Prior to this third-party announcement, we would submit software to Tandy and they would send us a form letter saying we'd hear from them in 90 days. We never heard anything from anybody, ever."

In the past, said the software maker requesting anonymity, Tandy has taken from a year to a year and a half to review software submitted to it. Juge said that won't be the case under the new program. "I doubt," he replied, "that one of our people will spend more than a day on any one package. It's not a review as if we're going to resell it."

The software maker also complained about the rates Tandy has paid independents in the past. "The LDOS people are getting $12 a copy from Tandy," he said, "which is not calculated to make you rich in a hurry."

Another element of the program, TRSDOS access, was rapped by Matthews of Apparat.

"If I were to write a program and put it on the market, I wouldn't put it out under TRSDOS if I knew anything about other operating systems," he said.

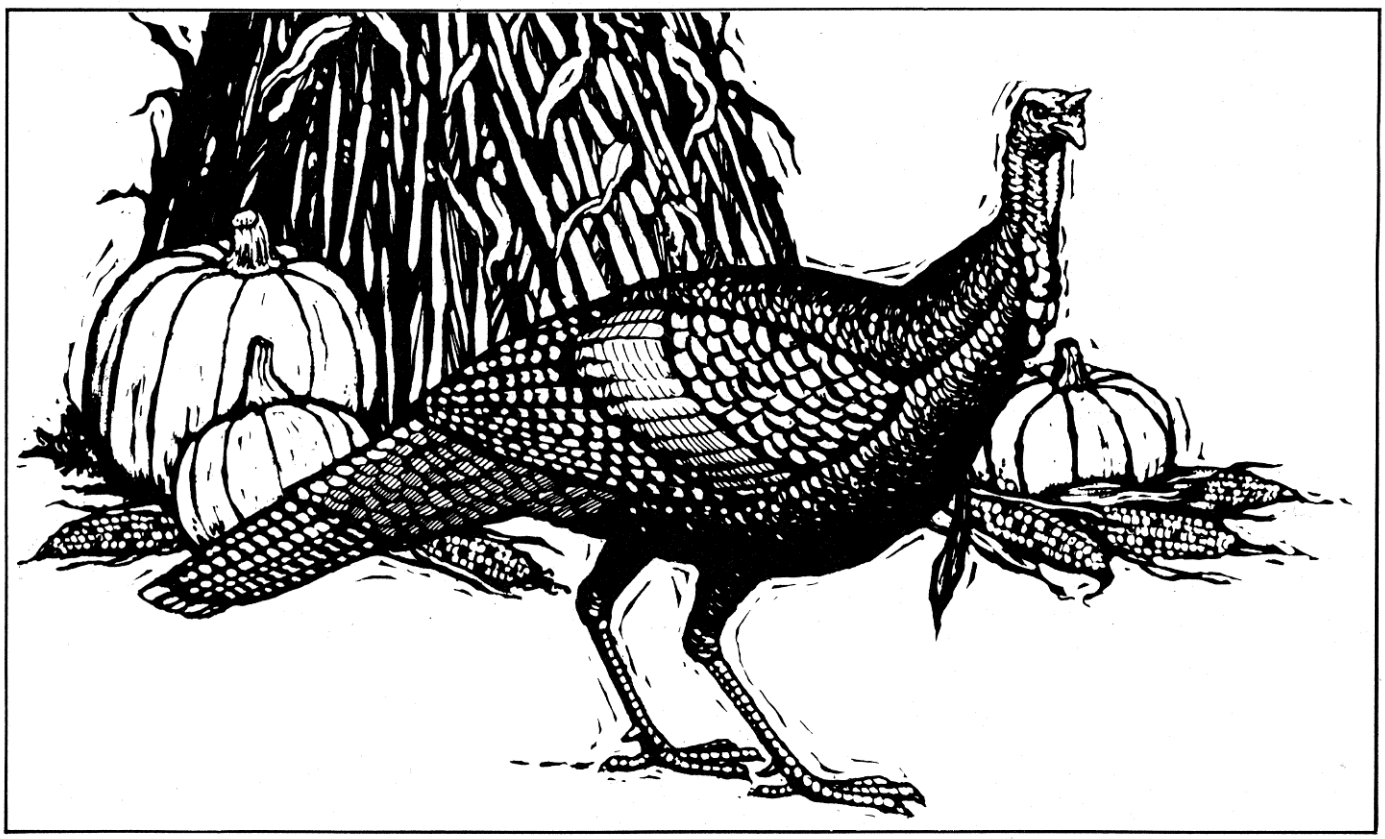
"People have lost confidence in TRSDOS," he added. "If you buy something in TRSDOS this year, next year Tandy changes it, and all your programs are out to lunch."

"TRS-80 users," he declared, "are pretty sophisticated and they're getting pretty tired of this. They're getting tired of Tandy changing its mind every two minutes."

Matthews surmised opening up TRSDOS access is Tandy's reaction to competition from DOSPLUS.

He explained any independent software writer can buy a stripped-down version of DOSPLUS from Microsystems Software for $2 or $3 a disk. "By

One major independent software maker: "I think Tandy is just trying to throw a bone to the turkeys."



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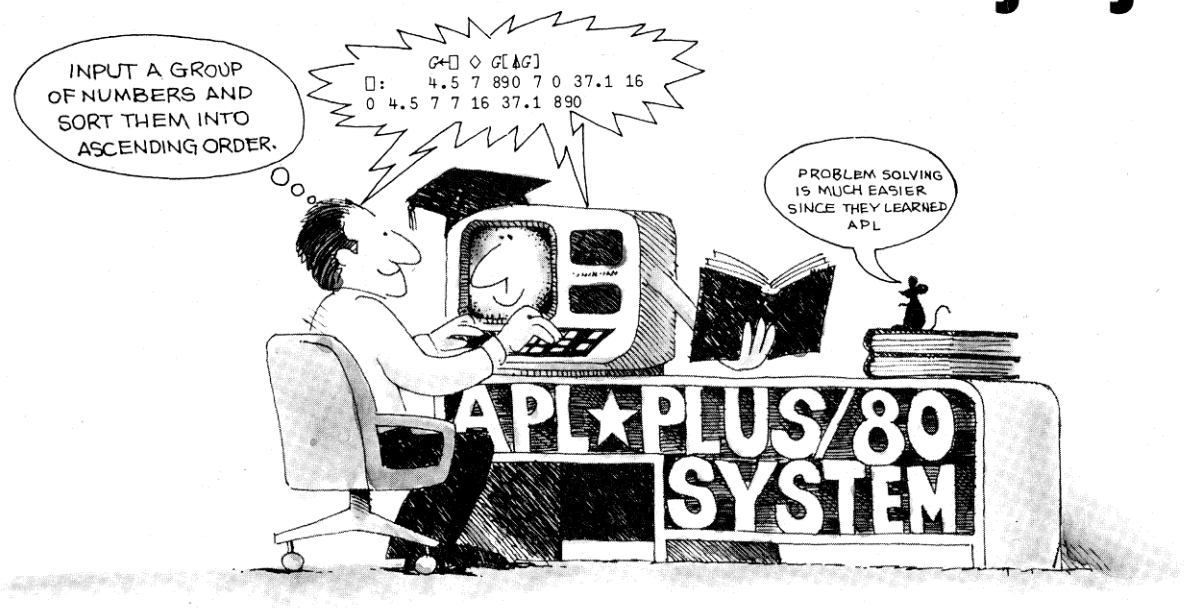

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```
3 COMB 4        2 COMB 4        4 COMB 5
  1 2 3           1 2             1 2 3 4
  1 2 4           1 3             1 2 3 5
  1 3 4           1 4             1 2 4 5
  2 3 4           2 3             1 3 4 5
                  2 4             2 3 4 5
                  3 4

    ∇ S←N COMB P;R
[1]   ⍝ MAKE SETS OF N ITEMS FROM P CHOICES
[2]   ⍝ RECURSIVE ALGORITHM BY ALLEN J ROSE
[3]    →((N=P)∨R←N=1)⍴L ◇ S←(R⌽1,P)⍴⍳P ◇ →0
[4]   L:S←1+(0,(N-1)COMB P-1),[1]N COMB P-1
    ∇
```

This example is found in the textbook provided with the APL★PLUS/80, *APL: An Interactive Approach*, by Leonard Gilman and Allen J. Rose. A detailed explanation of this APL solution is included in our free information package.

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doing that," he said, "DOSPLUS is flooding the market with their operating system. Not only that, but the DOSPLUS name is coming up on screens all over the country."

Publishing the source listing to TRSDOS is a dubious benefit of the program, claimed the software maker who wished his name withheld. "Tandy is willing to sell the source listing for TRSDOS. That's nice," he said, "since IJG is in the process of publishing those listings anyway for the whole world to buy."

When *Computer Business News* asked Shirley of Radio Shack why Tandy had changed so markedly its policy on support of independent software writers, he observed: "We had gotten comments from software developers, saying they'd like a little more help from us, and we got comments from customers who wanted a better way of finding sources for software for their TRS-80s.

"After all, there's a lot of software out there, and there's a lot of software still being written. We felt these policies would be a way of helping the people writing the software get together with the customers."

However, Matthews of Apparat maintained it was more than adherence to a customer feedback loop prompting Tandy to change its policy.

"I think Tandy is realizing if it doesn't do something soon, the wonderful world of IBM is going to blow them out of the water," he said.

"People coming out with microcomputers nowadays," he continued, "most notably IBM, are bending over backwards for people like ourselves, third party manufacturers, to make sure what they do doesn't bump software or hardware outside vendors may have developed.

"Tandy, for instance, in the doubler they made for the Model I, went to some pretty healthy lengths to make that thing incompatible with just about every piece of software on the market.

"Apple will bend over backwards to help third-party manufacturers. That's probably why Apple has the largest chunk of the market right now.

"I think that Tandy has finally decided that if they don't do something, if they don't do it quick, their market share is going to drop drastically and they're certainly not going to make a living selling CBs." ■

WETWARE

The future in Flatbush

Issac Asimov raps on computerized horizons at Brooklyn College conference.

A legislative commission focused on the challenges of living in a computerized society at a conference held at Brooklyn College in New York City.

Issac Asimov, author of 263 books and barker for Radio Shack computers, headlined the speakers at the session.

"There are no limits, in my opinion, to what computers can do...We have had nothing since writing, maybe since fire, with this potential to change our society," said Asimov, sporting his familiar gray muttonchop sideburns and western string tie.

The creator of the Foundation series of science fiction novels predicted computers will change literature. Readers will no longer be "passive recepticles," he maintained, but interact with novels.

Computer simulation will be a significant development for future societies, he told the some 150 conferees attending the forum at the invitation of the New York legislative Commission on Science and Technology and the Humanities Institute of Brooklyn College.

Before legislatures, businesses, or individuals make any decisions, they will create future scenerios via simulations, he said.

No one can predict the future—even with computers—he added. He cited an event in Wethersfield, CT, where a meteor hit a home. The chances of an outer space object doing that are very remote, he noted, yet it's the second occurrence in recent times it's happened in Wethersfield. "That tells me one thing. God is mad at Wethersfield, Connecticut," he quipped.

He predicted future computer games will create the illusion of participating in the contest by use of 3-D holograms. On existing video games, he observed: "You can't play these games without learning something. It's not worth learning, but it's learning."

Asimov said he uses his TRS-80 Model II only for rudimentary word processing and knows little about the micro. One day, he related, he feverishly searched the machine's documentation to discover how to print a number with an exponent. A quick call to Fort Worth solved his problem. "Did you look up superscript?" the service man asked.

After Asimov's address, panel discussions and workshops were held on privacy, education, and social changes.

Two experts squared off during the panel on protecting individual rights in a computerized age.

James Howard, an attorney and vice president of ICS Group Inc., argued governments threatened privacy more than banks and private sector businesses.

"National financial institutions," he said, "are painfully far from calling up information on customers at will." CitiBank needed to merge 20 data bases to get the information it needed for its home banking pilot project, he noted. The cost was tremendous.

Howard, former acting chief counsel for the National Telecommunications and Information Administration during the Carter years, said: "It is the government agencies that pose the greatest threat to privacy. Government, and not the private institutions, are the driving force behind the invasion of privacy."

That assertion was questioned by George Trubow, a flamboyant professor of information law and policy at John Marshall Law School in Chicago.

"We are losing our ability to define ourselves," he argued. The information about us in computer banks is used to define us, he contended, and to predict how we will behave. If a business can predict human behavior, then it can program human behavior, he maintained.

The biggest private sector threat to privacy, however, may be your next door neighbor, he said. "I'm less worried about Big Brother," he observed,

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"than little brother next door with his personal computer."

Fear of a massive central computer containing files on every citizen is misplaced fear, according to Norma Rollins, director of the Privacy Project for the New York Civil Liberties Union. She explained computer networking can create an omniscient data base without a large central computer being built.

Computer size occupied a prominent place in the discussions of the panel on the effects of computers on human values.

Opening the afternoon session on a nostalgic note, Brooklyn College Department of Computer and Information Science Chairman Frank Beckman said during the 1950s, computers were "quite impressive, not the sneaky little machines we have today."

If the old vacuum-tube technology were used to build an IBM 3081 today, the computer would be the size of the Houston Astrodome and require the Gulf of Mexico to cool it, said Denos C. Gazis, assistant director for IBM's Computer Sciences Department.

He claimed he has more computing power in his bedroom than IBM's research department had when he joined it in 1961.

Harvard Associate Vice President for Information Services and Technology Howard Resnikoff told listeners he envisioned a day when a microcomputer would be the size of a bacterium. The micro, he said, could be programmed to alert physicians when something is wrong in a body or even cure the ill.

A few years ago, he observed, people were concerned with creating life artificially. "Now we are on the verge of something more startling," he said. "The creation of thought without any life at all."

Dr. Resnikoff, wearing a gray pinstripe suit and sporting a beard without moustache, predicted if legislative concern over automation produced limitations on using robots "overseas interests will reap the rewards of our concerns—not American workers."

"The possibility of good [from computers] is limitless," he said, "but the possibility of evil is not negligible."

Despite humanity's penchant for recording knowledge, history's shown old wounds are best healed with the passage of time. But computers will change that, too, according to Gazis. "Computers," he said, "will take away our benign ability to forget." ■

HARDWARE

Nightmares into sweet dreams

A company named TRW plants seed for would-be personal computer service network.

Have you had this nightmare? You sit at your micro, try a cold boot, and nothing happens. Unless you're electronically inclined, you suddenly experience a sick, sinking feeling where your stomach ought to be.

Relax. It was only a dream. But should it become a reality, a company named TRW may be some help to you in the future. The firm's Fairfield, NJ, Customer Service Division has opened a personal computer service center in Dallas, TX, and has its sights set on opening more next year.

John Harnett, the division's director of planning and development, said in a statement the center will offer the general public the high caliber of service historically reserved for large commercial computer users.

"We're taking the hassle out of personal computer repair for the individual consumer," he observed. "The speed and efficiency of service this center will provide are going to set standards for the industry."

The center will service most major brands of computer-related equipment including video games and TRS-80s. "That's not one we're actively seeking," TRW Marketing Communications Manager David F. Gill said of Tandy's micros, "because Radio Shack has its own service centers. On the other hand, if they bring it in to repair it, we will certainly repair it."

The centers might offer a service alternative to TRS-80 owners who've upgraded their micros with foreign parts and add-ons. "We will service it with whatever parts it has," Gill told *80 Micro*. "The only limitation we have on that is obviously the availability of spare parts to us."

Gene Carson, one of the center's managers, feels short turnaround time will be a major plus for the store. "When your personal computer breaks down," he said in a statement, "you won't have to ship it to a remote service center and wait days or weeks for its return. Just drop the equipment off at our center and in most cases, we will have it ready for you within 24 hours, sometimes even while you wait."

The center will do chiefly component repair, Marketing Communications Manager Gill explained. Components will be repaired on their original boards. However, there's an exception to this rule when there's heavy traffic in an item. "We'll say, 'Okay, these boards are the ones that typically go bad,' " Gill said. "We'll stock those boards, replace them when they come in, and turn them around in 10 minutes."

He explained, "A lot of things that go wrong with a micro are very common and don't require an exotic part or something of that nature."

"Printers give the biggest problems of the mechanical devices, " he continued. "Any mechanical device is subject to wear."

Inside the micro, he noted, problems usually originate with disk drives, which are mechanical, or blown fuses.

He added, "The biggest single problem is mishandling diskettes."

Prices at the center are fixed at $25, $50, and $100, Gill said. If it appears a repair will cost more than $100, a customer is notified. "We will do an estimate on it," he added, "and stick to that estimate."

Manager Carson said the center warranties repairs for up to 90 days. Future

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Now, when I tell you that these are the best Accounting programs I've seen on a microcomputer, you probably think that you are just listening to another sales pitch. But you're not. You're listening to a businessman with over twenty years combined experience in sales, management, and programming. So when I say that these programs will work for you, it really means something.

Each program, designed for the Model II or 16, will work with one or more floppy or hard disks. With each program, I'll include a 200 page manual written with the first time user in mind, and a set of sample data files so you can start using the program right away.

But I won't stop there. If you have a question, or a problem, call me. You won't get an operator, or order taker. You'll get me. And if I can't talk to you on the spot, I'll call you back. And I'll fix your problem. FAST.

Now I could say a lot more about these programs, but you really won't know how good they are until you try them. So, order the programs you need, and try them for 14 days. If you're not convinced that these are the programs for you, send them back, and I'll refund your money.

My price for these programs is only $289.00 each, postpaid. I could charge hundreds more, but I want you to have the best programs at the best possible price. So mail or call your order in today. I'll make sure you'll be satisfied.

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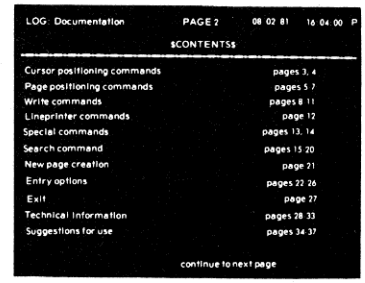

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plans call for service contracts where customers can sign yearly agreements to cover maintenance and service on their equipment.

The center also provides computer supplies, software, publications, and a computer bulletin board.

Gill added the center will upgrade a customer's micro. "We will not recommend anything," he said. "However, if someone comes in and asks if this thingamajig will work with that gizmo, we will look at it and tell them if it will or won't."

Extensive expertise and a large parts inventory are keys to the center's effectiveness, Carson maintained.

"Our four managers have nearly a half century experience among them," he said. And according to TRW, its service division services more than 700,000 pieces of equipment for 80,000 customers and makes more than 2 million service calls annually.

"We have an extensive parts inventory," Carson added, "and what we don't have we can get overnight from one of our commercial repair centers."

Carson's statement mystified Jon Campbell, press relations manager for Texas Instruments' Consumer Group. "I spoke to the people that run our repair center and they have not heard from TRW about this," he told *80 Micro*. "They were a little puzzled. How could TRW do repairs on the 99/4A if they haven't contacted us for spare parts?"

He said, "We do not have any outside arrangements to repair our units and we are not looking for any."

He added if a 99/4A were still under warranty when TRW repaired it, the TI warranty would be voided.

Texas Instruments has 50 exchange centers in the nation, he explained, where, if a 99/4A breaks down, its owners may exchange it for a new one or have it repaired. Exchanges are free during the warranty period, $45 after the period ends. Costs for repairs range from $25 to $80.

Other computer manufacturers hadn't heard of TRW's efforts in servicing personal computers.

Commodore, whose business systems are serviced by TRW, was unaware the TRW center might be servicing VIC 20s.

A spokesman for Commodore said if something goes wrong during the VIC 20's warranty period, it can be returned to point of purchase for a new machine. After the warranty expires, he added, VIC 20s are sent to one of Commodore's factories and the user is sent a factory reconditioned unit within 48 hours.

"The Commodore 64," he said, "is only being sold through computer dealers. All computer dealers are required to be service centers as well. The dealers can solve 90 percent of the problems that come up. The other 10 percent will be referred to regional service centers."

An Atari spokeswoman said she recommended Atari computers be brought only to the 1500 service centers the firm has established across the country.

For firms, like Apple, requiring their dealers to provide service, TRW could offer an alternative service channel. A number of dealers and distributors have approached TRW, Marketing Communications Manager Gill claimed, and said the service center approach was a "great idea." He added, "They'd rather concentrate on selling and let us service it."

The first TRW center opened last October. This month or next, TRW will be assessing it to see if they should start up more of them. "If things are growing and we've got a steady trend upward, we will expand to as many as 15 more places next year," Gill said.

Planning and Development Director Harnett added, "Besides providing first-rate service, I believe these centers will help take some of the mystique out of computer usage.

"The more people realize that computers can be like other equipment they use daily to make life easier, the more computers will be found in the smaller office and home. By repairing them quickly and effectively, we're promoting this message." ■

BUSINESS

Rent-a-computer

If you're in Champaign-Urbana, IL, you don't have to own a micro to use a micro.

BY P. GREGORY SPRINGER

SPECIAL TO 80 MICRO

Is rent-a-computer the next big thing, an idea whose time has come? The McDaniel family of Champaign-Urbana, IL, hope so, and they've begun a business to test the theory.

In the heat of summer—in a former typewriter supplies store on the main campus at the University of Illinois—Marvis Jerry McDaniel, his son Myron McDaniel, and other investors opened up Micros Unlimited Inc., a name with a big claim to keep. Twenty-seven computers, most of them TRS-80 Model IIIs, have been stationed in individual four-foot-by-five-foot carpeted cubicles, with printers and paper and all the peripherals anyone would ever need. Epson printers come furnished in each booth, with a daisy wheel letter-quality printout available at an extra charge. There's room for 60 computers in all, and the McDaniels hope not only to expand the business locally, but in other locations as well.

Who wants to rent time on a computer?

"Students, especially graduate students, are the prime market," explained the senior McDaniel, who graduated in engineering from Illinois in 1953.

"Law students, graduates who need cover letters and resumes written, people who need to swap address blocks and do multiple printing."

"I've been working as an independent consultant for computers for 20 years here," he said, "and we have not yet begun to explore the use of media in getting computer possibilities understood by the students. More than half our customers now are students, but—like the mule—they're going to have to be hit on the side of the head to get it through to them what word processing is all about. They might think it's only for business, they have no clear idea of what they are capable of doing with computers."

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puter science students, the liberal arts and science school, and commerce departments were invited to several open house demonstrations of what microcomputers can do for the busy student who's all thumbs at a keyboard.

While McDaniel spoke, a customer walked into the brightly lit reception room and inquired about an IBM Displaywriter to rent. "We'd have to charge $20 an hour for that!" whispered the younger McDaniel, after the customer is told none is available at the moment. "That's a $12,000 machine!"

Micros Unlimited might not be able to offer a computer user every model he or she would desire, but it's making an effort to have variety and simple access for inexperienced users.

"There are too many variations of software to deal with for most dealers to be able to explain them properly," Jerry McDaniel continued. "Scripsit is easiest to learn. We teach it in a matter of minutes. Within 30 minutes to an hour, we have people working on it.

"A German student came in this afternoon and composed two letters in 45 minutes. He had no previous computer experience.

"Most software documentation is disappointing, perhaps keeping more people away from computers than drawing them to them. The manuals are written by people who know the hardware and assume that everyone else does too. We tried the AppleWriter for six hours one night and gave up. The manual was terrible.

"Micros Unlimited will write its own instructions for customers. What do you want to do? How do you do it? Books and manuals often don't tell you what will happen when you follow their instructions. It's like a game. How do you turn on the machine in the first place, for example? The switches aren't where you can see them."

For an hourly rental fee averaging $3.80, students, businessmen, and university faculty have been coming to Micros Unlimited and learning about computers in the process. Word processing software is available for term papers, theses, letters, and reports. VisiCalc, Cobol, Pascal, and Fortran are also available for solving engineering problems, financial projections, and scientific calculations. Programs to check spelling and grammar have helped some students with papers that need reworking before they can be submitted for a grade. For the slight fee charged, it can be a reassuring pregrade reading.

Photo by G. Gregory Springer

Micros Unlimited: Model IIIs with printers, paper, and all the peripherals anyone would ever need.

When asked what would prevent home computer owners from merely copying these software programs for their own use, McDaniel replied: "The law. Everyone must sign a release when they work here, stating that they are renting the equipment and the software. It's like any recording or duplicating copyright problem. Also, our diskettes are write protected with tabs."

Although Micros Unlimited uses Scripsit for most of its word processing customers, the problem of underlining and superscripts—frequent requirements for college students—hasn't been fully dealt with yet. "Sometimes they will add the underlines manually," McDaniel said. "We aren't using SuperScripsit at this time. We do have ScriptPlus available for certain jobs. We also have WordStar and CP/M for other jobs. We have a variety of computers."

In addition to setting up a work space for computer users who can't afford to own their personal machine, Micros Unlimited sells and rents out both hardware and software.

"We rent machines to businesses; it's usually too expensive for individuals. The Democratic congressman team uses one of our machines 22 hours a day these days. We also rented out Profile III+ to them, although we try to avoid renting software. We encourage people to buy it by charging a hefty amount. We try to be fair to the creators of software."

The McDaniel family stresses Micros Unlimited is basically aimed at the individual who needs a short-term use of word processing or computing capability. To encourage this, they've formed a club. It offers members:

- A disk;
- Four hours of free time;
- Free unlimited use of instruction tape and cassette;
- Discounts on future rentals;
- Free use of a spelling and grammar checker; and
- Discounts of up to 20 percent on the programs, books, disks, and magazines.

The hardest thing to stock so far, they have found, is the magazine rack. For some reason, the local news service has been protective with the distribution of popular computer magazines. "We had to go out and raid his place to get any in here at all," McDaniel explained. "It's about time to go out and make another raid, too." ■

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GAMES

Custer's Lewd Stand

Clad only in hat and boots, Little Big Horn loser chases Indian woman and whips up national imbroglio.

BY JOHN P. MELLO JR.
80 MICRO NEWS EDITOR

From coast to coast, a microcomputer game depicting the alleged rape of an Indian woman by General George Armstrong Custer has been slammed by concerned groups. But the pasting "Custer's Revenge" has taken in public may only fuel sales, according to two blue marketeers.

"I think the controversy is going to accelerate the game's sales considerably," contended Daniel Ellis, publisher of *The Dirty Book*, a twice-a-year listing of "erotic" software.

Asked how the Custer's Revenge flap would affect his games, J. P. Nelson said, "I think it can only help them. Nelson, board chairman of Computer Kinetics Corporation located in Westlake Village, CA, explained his firm makes three coin-op games placed "strictly in adult locations."

Stuart Kesten, president of American Multiple Industries in Northridge, CA, reportedly predicts his firm will sell 750,000 copies of Custer's Revenge. If that prediction proves true, the game would gross more than $3.7 million for American Multiple.

The corporation makes two other blue games—"Bachelor Party" and "Beat'em and Eat'em"—but neither has sparked the outrage caused by Custer's Revenge.

When American Multiple demonstrated the game last October at the National Video and Audio Conference in New York City, some 100 people representing women's and American Indian groups demonstrated against it.

Since Custer's packaging includes a reference to Atari, the game giant entered the melee, claiming its good name had been sullied. It alleged American Multiple had tried to cash in on Atari's trademark and filed a lawsuit against the American Multiple in federal district court in Los Angeles.

Legal action against American Multiple is also contemplated by the American Indian Movement.

Meanwhile, local governments joined

the controversy. In the Sooner state, the Oklahoma City City Council adopted resolutions condemning the game. And the Los Angeles Board of County Supervisors adopted a three-pronged attack against it.

Opponents of Custer rail the game because they claim it condones rape, is racist, and is sexist.

Betty Rosenstein, head of the Los Angeles County Commission on the Status of Women, declared, "We are horrified that there are games in which entertainment of the players comes from the act of rape and sexual assault against women."

"We are very disturbed at its idea that rape is acceptable, that it's supposed to be fun," observed Helen Parolla, director of New York City's YWCA Center for Public Policy.

The National Organization for Women also found the game offensive. Among its objections: The game trivializes the pain and humiliation suffered by the one in three women raped in her lifetime and promotes the idea a manly man is a rapist.

"It's making the player of the game a third-party participant in the rape," noted a spokesperson for Women Against Pornography in New York City. "This is a new dynamic. In the past, a person has been a viewer of pornography, not a participant. You are maneuvering Custer over to the Indian woman tied to a post. You're maneuvering him to rape her."

"It rewards a player for rape," she said. "That's how you win the game. It's making rape something to be rewarded for."

The spokesperson's comments become more sobering in light of recent findings in *The Journal of Communication* published by the Annenberg School of Communication at the University of Pennsylvania.

In a study of pornography, Penn researchers discovered male and female students who watched a large number of blue movies found rape less objectionable than similar students who watched nonerotic films over the same period of time.

Repeated attempts by *80 Micro* to reach American Multiple's president by telephone failed. However, Custer's creator, Joel Miller, reportedly denies the 7th Calvary's fearless leader rapes anyone. "He's seducing her," Miller is quoted as saying, "but she's a willing participant."

Kesten told wire service reporters: "Our object is not to arouse; our object is to entertain. When people play our games, we want them smiling. We want them laughing."

"The idea of the game itself is to have fun, not just to have a cheap sexual joke," he said. "These games are not meant to arouse and I would wonder about anyone being sexually aroused by them."

Custer's detractors also found the game racist.

Resolutions adopted by the Oklahoma City City Council stated, "Responsible citizens representing all segments of society are repulsed both by the vulgarity of this video game and its calculated insult to minority groups in

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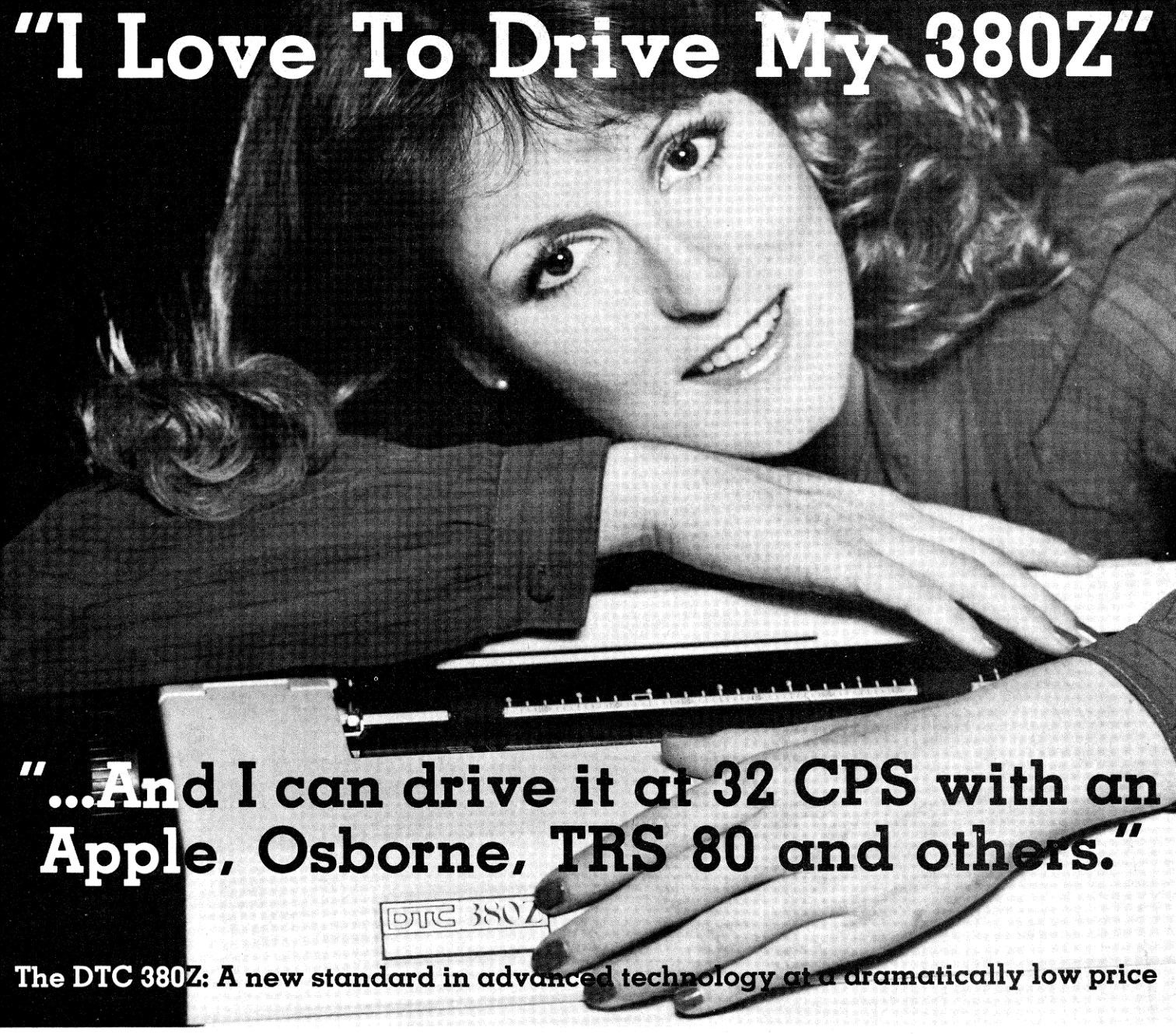

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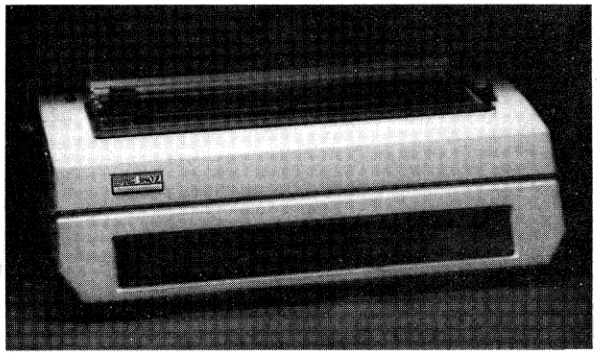

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America."

And in a letter to Kesten, YWCA National President Jewel Freeman Graham and National Executive Director Sara-Alyce P. Wright declaimed:

"It is a sad symbolism in our society when the sexual overpowering of a nude Indian woman by an American general is considered by your company either comedy, victory, or fun. The blatant racism of a white male attacking an Indian woman in this suggestive manner contributes to the continuation of a racist-sexist society."

The National Organization for Women declared the game promoted the acceptibility of raping Indian women, masked and trivialized the racial genocide practiced by the real Custer, and used the new technology to degrade the American Indian community rather than advance ideas of equality and humanity.

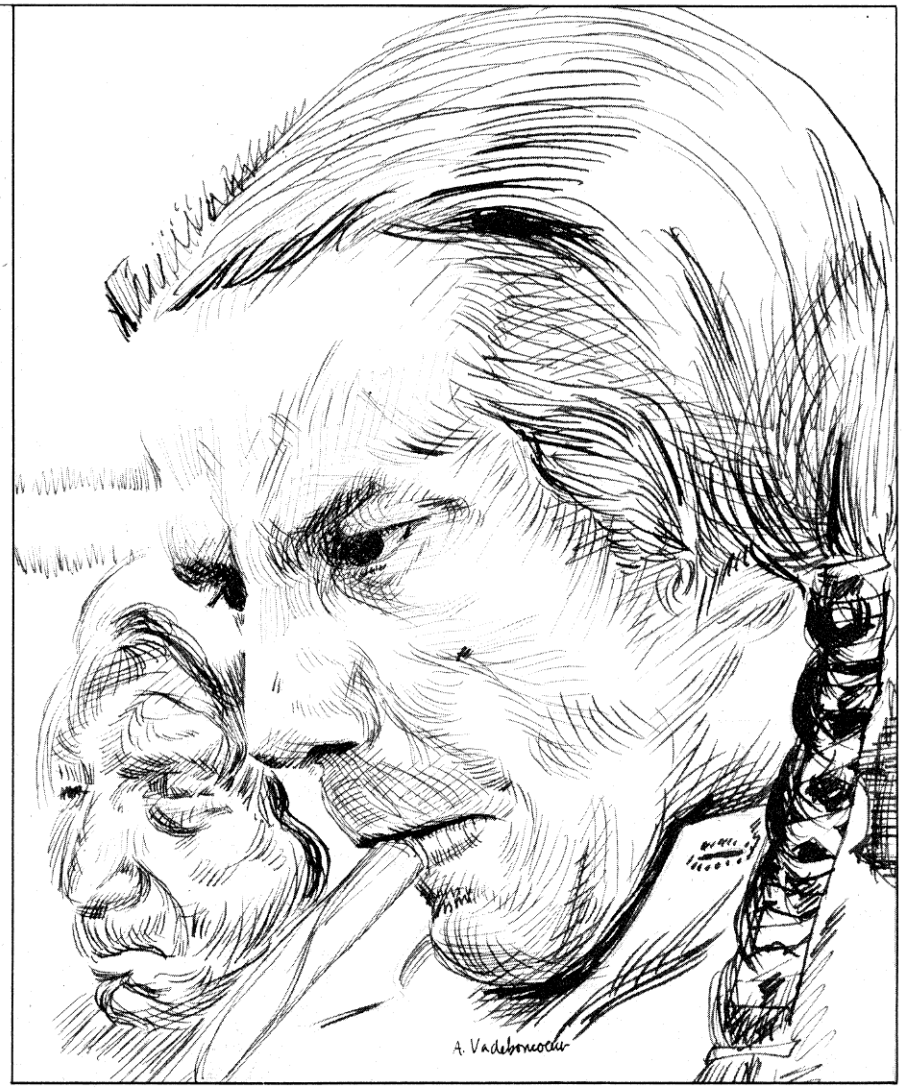
"As American Indians," said Rudy Martin, public relations director for the American Indian Community House in New York City, "we are vehemently opposed to the exploitive use of our race for the titillation of the public. We see this disgusting video game for what it really is: a sexist, racist, sadistic expression, the sole purpose of which is to fill the pockets of its creators and promoters."

He asked: "Would the characterization of a people be acceptable if it depicted Begin attacking a Palestinian woman, Prince Charles chasing a female IRA member, or Hitler having his way with a naked Jewish maiden? We think not."

"Tomorrow it will be an attack against someone black or brown or homosexual," Rosenstein of L.A. County added. "And then an assasination against a president. Do we want to live in a community with that kind of sickness?"

"The only result this game will have," Martin said, "will be to promote a casual attitude toward racism, a misguided sense of white, male superiority, and the reenforcing of the stereotyping of American Indians as something less than human."

He called the game "a statement of the deterioration of what was proclaimed proudly as American society" and said "it serves only to perpetuate the violent and sexist characterization of American people in the eyes of the world."



Banks: Strung-out lawsuit.

"We have enough sickness and violence in our community without adding more to it," Rosenstein observed. "I guess the real question is, do we really want to have a community where recreation is based on humiliating and degrading and dehumanizing women."

Apparently, these issues were less nettlesome to Atari, lambasted for making the medium for Custer's unsavory video deeds.

"Atari takes a very dim view of this use of our product," Atari Consumer Products Division President Michael Moone said in a statement.

"We are quite upset," he continued, "with someone who has chosen to use our product for a purpose which was not intended.

"We intended the product for wholesome family entertainment, but to say that Atari is responsible for this occurence would be as illogical as censoring a camera company for making cameras because a few people take pornographic photographs."

Although Custer's opponents want the game banned, they realize the law offers them little recourse.

"Unfortunately," lamented Moone of Atari, "some individuals take refuge behind certain legal precepts to the dismay of the majority of the people."

"We're not looking to run into the First Amendment," Atari attorney Kenneth J. Nussbacher told the *New York Times*. He said American Multiple failed to adequately disassociate itself from Atari and capitalized on Atari's name and trademark.

Kesten of American Multiple saw

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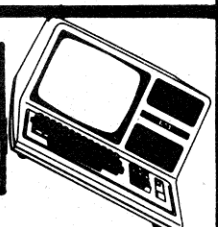

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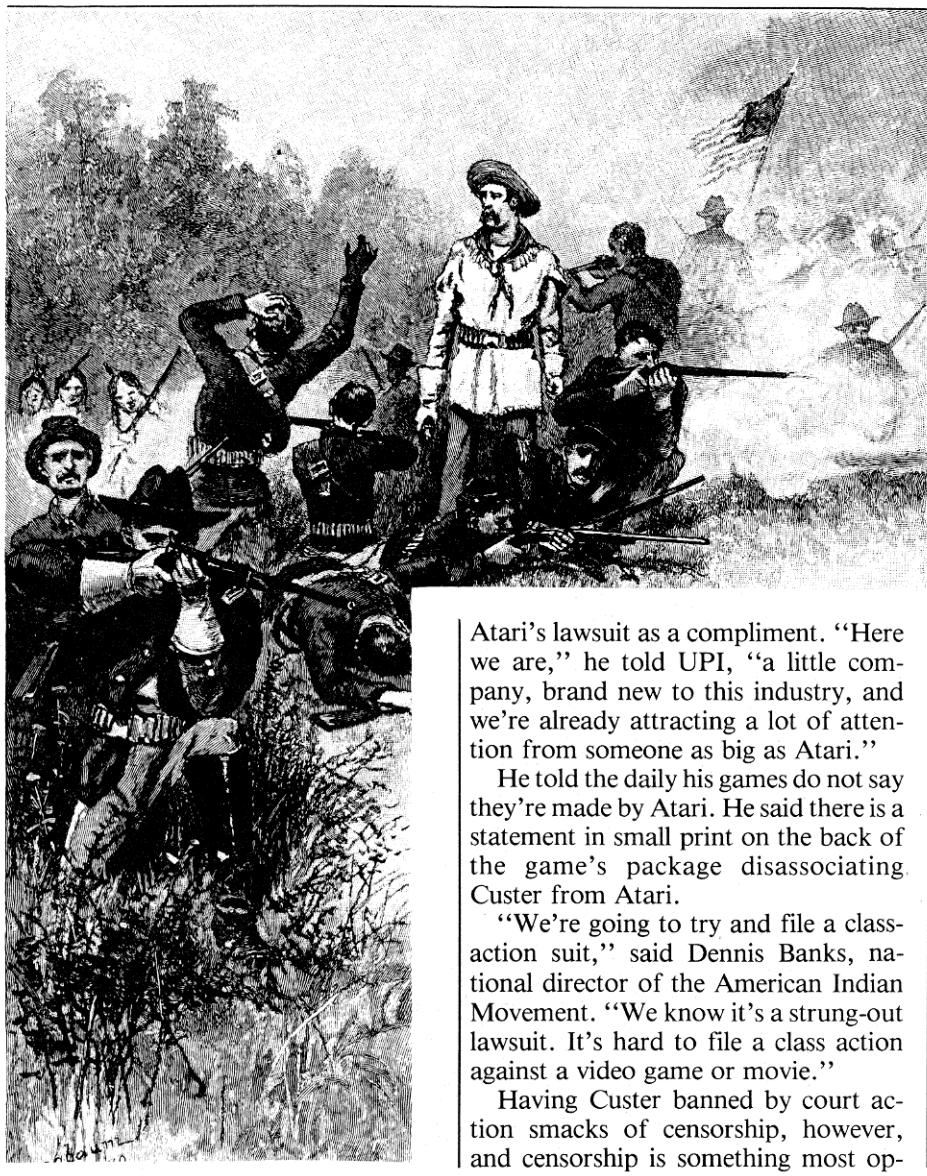


Atari's lawsuit as a compliment. "Here we are," he told UPI, "a little company, brand new to this industry, and we're already attracting a lot of attention from someone as big as Atari."

He told the daily his games do not say they're made by Atari. He said there is a statement in small print on the back of the game's package disassociating Custer from Atari.

"We're going to try and file a class-action suit," said Dennis Banks, national director of the American Indian Movement. "We know it's a strung-out lawsuit. It's hard to file a class action against a video game or movie."

Having Custer banned by court action smacks of censorship, however, and censorship is something most opponents to the game are shying away from.

"We are not talking of censoring," Rosenstein of L.A. County observed. "We are talking about sensitizing the community."

However, the three-point plan Rosenstein's commission proposed and L.A.'s county supervisors adopted included drafting legislation to prohibit video games like Custer and instructing the county's counsel to study adopting a similar ordinance on the local level.

Glynis Edgar, director of community relations for the Oklahoma Human Rights Commission, said her agency hopes the anti-Custer resolutions adopted by the Oklahoma City City Council "will discourage folks from buying [the game] and discourage stores from wanting to have it."

She added, "By no means are we advocating it be banned."

But Edgar admitted when one adult book store owner in Oklahoma City was contacted by opponents to Custer after the city council's action, it was apparent he wasn't going to be deterred from carrying the game.

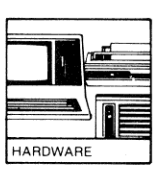
Atari called on all concerned parents to write American Multiple and "hope the public outcry will persuade the maker to remove their product from the market."

How effective will that be?

"Stuart Kesten," Banks said, "told our people he has invested too much money in it to bring it off the market." ■

PULSETRAIN

14 Illini and a robot Rubick solver



"Yes, I refer to Robbie as 'him,' rather than 'it,' " confessed Daniel Talken, one of 14 engineering students at the University of Illinois responsible for the creation of a robot that solves Rubick's Cube in 'his' own overhead mechanical hands. "He's really a toy, though."

Apart from giving the machine eyes, nose, mouth, and personality, the creation of Robbie Rubick is especially noteworthy for the team effort which went into his design.

When a member of Tau Beta Pi Engineering Honor Society first came up with the idea, three branches of the fraternity set out independently to solve the necessary problems involved. The computer engineers developed the program for solving any scrambled cube. The mechanical engineers worked on the device to manipulate a standard cube with electrical signals. And the electrical engineers were responsible for connecting the computer to the mechanics. Each group worked independently of the others. Five months and $450 later, Robbie was born.

"Most of the work was done on faith, luck, and hope," Talken said. "None of us knew whether or not the others were going to be able to interface with all the plans."

Using a color-sensing electric eye, computerized brain, and mechanical hands to twist and turn the cube, Robbie accepts a solution from his terminal in about two-

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tenths of a second. An average of 10 moves is needed to complete the cube, which takes nearly six minutes of twisting and turning. "Most people who can solve the cube can beat the mechanics, but no one has yet been faster than the computer."

So far, Robbie—who made his first public appearance at the annual U of I engineering open house before an applauding audience of 4,000—has been acknowledged nationwide through the *New York Times*, Paul Harvey, and the CBS Evening News.

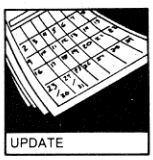
"The next step is to add color photo sensors," continued Talken, "so that Robbie can read the initial configuration himself and solve the cube in the push of a button. There will be a Robbie Rubick II."

—P. GREGORY SPRINGER

Photo by P. Gregory Springer

Henry J. Springer and Robbie Rubick toy with a popular puzzle.

Tandy wants your phone business



After waging a guerrilla war against the AT&T monolith (*80 Micro*, January 1983, p. 384), Tandy Corporation has moved to bolster its competitive position in the telephone business.

The Fort Worth, TX, firm has bought a manufacturer of business telephone equipment and announced it's getting into telephone paging.

Acquisition of the assets of Interconnect Telecommunications Systems Inc. of Lexington, KY, was revealed at Tandy's annual stockholders meeting held in Fort Worth in November. Tandy did not disclose how much cash it paid for the firm.

For its 1982 fiscal year ending June 30, 1982, the Interconnect firm, which serves parts of Kentucky and Ohio, had sales of $8.5 million, Tandy said in a statement.

During the same fiscal year, Tandy's telephone and related equipment sales increased 35 percent over FY 1981. The sales represent 6.5 percent of the firm's $2 billion in sales for FY 1982.

Chairman John V. Roach told stockholders Tandy also intends to open "four or five" experimental telephone stores early next year. The stores, which Roach claimed will offer customers "a totally new concept in telephone merchandising," will be opened in Lexington and Louisville, KY, and Fort Worth.

"Since the concept is new," Roach said in a statement, "we will reserve most of the details until the first store opens. The name of the new chain will be Radio Shack Telephone Center. Our primary thrust in the phone business will continue to be through the regular Radio Shack stores."

According to *The Wall Street Journal*, the new stores will "probably" sell devices linking computers and telephones. In existing stores, the *Journal* added, Tandy is expected to begin marketing equipment early this year for electronic mail between personal computers.

Timothy Diachun, chairman of Interconnect, will join Tandy as vice president for telephone marketing.

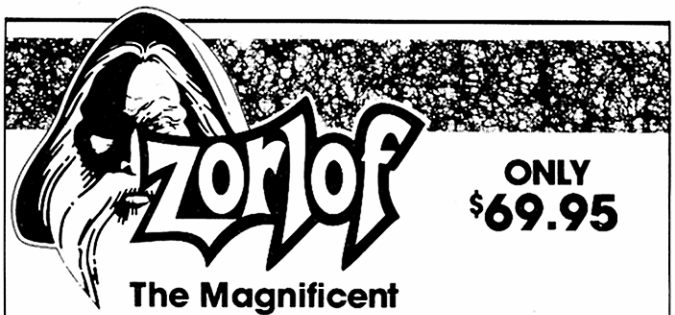
Roach also announced Radio Shack would start marketing pocket pagers early this year. Although the retail price hadn't been finalized, he said, it would be significantly lower than the $175 to $200 being paid for basic units today.

He noted in a statement Tandy has signed contracts with radio common carriers or Bell operating companies in 54 cities. Those include New York, Boston, Chicago, Los Angeles, Houston, Atlanta, San Diego, Fort Worth, Dallas, San Francisco, Philadelphia, Baltimore, and Washington, DC.

Under the agreements, he explained, the carriers would offer paging services at a fraction of the current basic rates for paging. Those rates range from $10 to $20 a month.

"We are hopeful that once again," Roach said, "we will be able to take a product from its traditional market (i.e. commercial and emergency use only) and, with a new breakthrough in cost, make it a mass market item."

Tandy's chairman added the move "could open the door to us becoming a factor in the emerging mobile telephone market and the future personal, carry-it-with-you-



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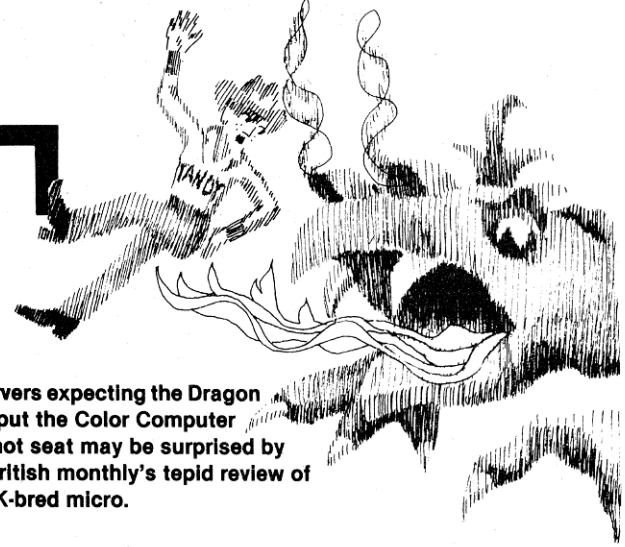


Observers expecting the Dragon 32 to put the Color Computer on a hot seat may be surprised by one British monthly's tepid review of the UK-bred micro.

anywhere market. The day is coming, for better or worse, when you cannot avoid communications wherever you are."

"All this," Roach observed, "is designed to help us make good on one of our new trademarks, 'Make Radio Shack Your Telephone Company.' "

British mag gives Dragon tepid review

"The similarity between the Tandy and the Dragon 32 is almost uncanny and the reason is not simply because the same chips have been used."

That's what one reviewer opined in a review of Britain's home-grown micro (*80 Micro*, January 1983, p. 370) appearing in the November 1982 issue of *Computing Today*.

"The first thing that strikes you about the system," the British microcomputer magazine said, "is that it has a 'proper' keyboard although the quality of the particular unit chosen is a little dubious."

"Readers who are familiar with the TRS-80 range of systems," the reviewer said, "might be hoping that the format of the text screen found on the Dragon 32 would be an improvement. No such luck, it's still 16 lines of 32 characters in text mode with no lowercase letters, reversed uppercase being used instead."

The reviewer was critical of the Swansea, Wales, micro's color. He said "the primary colors are not clean; red, blue, and green should be red, blue, and green and not 'off' shades."

When the Dragon is fired up, a memory check might surprise some users. Although the micro is touted as a 32K machine, only 24K is available for programming.

"The missing 8K of RAM hasn't really vanished," the reviewer explained, "it is being used for the system variables and to create high resolution graphics areas. While this means less space for you to program in, it does mean that when you come to use the high resolution graphics your memory doesn't shrink dramatically like some other systems we could mention!"

"For those into data handling," he continued, "the cassette interface can be used for data files through Basic although the reliability of the system is not particularly good. The interface seems slightly level sensitive, but my main criticism would have to be the lack of decent messages; single letters displayed on the screen don't count as messages in my book!"

The reviewer added there are two interesting cassette commands. Files can be skipped by using SKIPF. Using MOTOR will allow a tape recorder to be controlled from the keyboard. That can save time fiddling with the remote plug.

Programs may be halted during running by pressing shift @. Pressing any key but break will restart the program.

Simple, single-tone noises can be produced from the Dragon using SOUND, the reviewer said. More complex sounds can be created using PLAY. That function, he said, is similar to one found in Sharp's computers. A complete note passage, pauses, and changes in tempo, may be programmed into a string made up of a note name, octave, duration, and volume.

The reviewer found the micro's printer port a bit of a mystery. "A quick count of the available peripheral devices inside the Dragon 32 leads one to wonder just how they managed to create this extra parallel port as there simply aren't enough bits available," he observed.

"The only possible explanation of this," he said, "is that the printer shares the same PIA as the joysticks; it uses the port as an output whereas the joysticks use it as an input."

Contrary to the opinion of one Tandy-UK executive and the experience of *80 Micro's* Jake Commander, *Computing Today* was skeptical of plugging Radio Shack ROM packs into the Dragon.

"The indications are that they should [work]," the reviewer noted, "but without complete information on the pin connections of the Dragon 32, I'd rather not suggest that you plug one in and try!"

Documentation for the micro wrung a tepid response from the reviewer. "The manual...as manuals go," he said, "is not too bad. There are a number of small errors which may well have been cleared up by the time the machine hits the streets in a big way, but the main feeling is one of missing information.

"There are no details on any of the hardware, interface connections or add-ons. Nor are there any facts about the monitor program and how to get 6809-code into the system."

For those "really interested" in pursuing the Basic on the Dragon, the reviewer suggested they buy two books from Tandy, *Going Ahead with Extended Color Basic* and the *Color Computer Technical Reference Manual*.

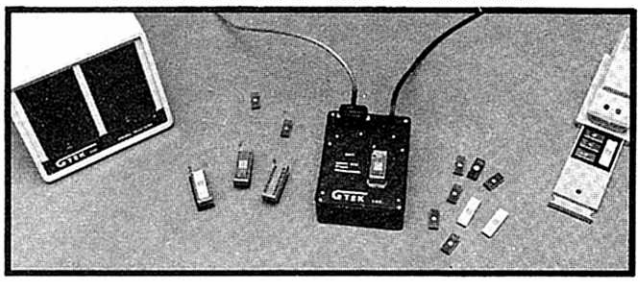
"Just what has the Dragon 32 got over its rivals?" the reviewer asked. "Well, if you were looking for a home computer to play games with and maybe try a little programming on, it does have the advantage of a reasonable amount of RAM and an almost decent keyboard.

"As an alternative to the Tandy Color Computer it wins on price alone although it certainly doesn't look as nice.

"As for its other rivals, the Atari and Texas systems, the choice of ready-to-run games and add-ons possibly tends to weigh against the Dragon 32.

"Another possible source of concern is that Mettoy [the parent company of Dragon Ltd.] has never been in the computer market before whereas both the others have a long pedigree but, in reality, there is little that can go wrong in a system like this that cannot be simply and easily fixed." ■

DEVELOPMENT HARDWARE/SOFTWARE
GTEK MODEL 7128 EPROM PROGRAMMER



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- RS-232 interface and ASCII data formats make the 7128 compatible with virtually any computer with an RS-232 serial interface port.
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- Use with or without handshaking. Bidirectional Xon/Xoff supported. CTS/DTR supported.
- Devices supported as of DEC 82.

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2716	2516	27C32	X2816	8749
2732	2532	C6716		8741
2732A	2564	27C64		8742
2764	68766			8751
27128				8755

- Read pin compatible ROMS also.
- Automatic use of proper program voltage based on type selected.
- Menu driven eprom type selection, no personality modules required. (40 pin devices require adapter)
- Supports Intel and Motorola data formats as well as conversational hex formats. Formatted screen dump and block read commands.
- Interupt driven type ahead, program and verify real time while sending data.
- Program single byte, block, or whole eprom.
- Intelligent diagnostics discern between eprom which is bad and one which merely needs erasing.
- Verify erasure command.
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MODEL 755 allows programming the 8755 EPROM/IO chip Price $135.00

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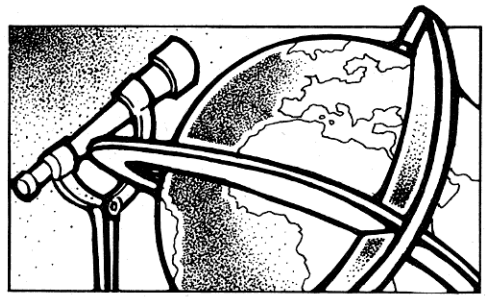
by Bruce Douglass



Computerized aerobic mathematics

Let's talk about exercise physiology this month. I'll use the regression program published in December 1982's "Copernica Mathematica" to create an equation for aerobic points based on distance and time. I'll also develop the concepts of moving averages and autocorrelation of time series data to monitor the heart rate and look for periodicities and trends.

Basic Physiology

The heart functions as a pump to move blood (which carries oxygen and food to the muscles and carbon dioxide and waste products away from the muscles). There are two major controls of the heart: nervous and the so-called "Starling's Law of the Heart."

Nervous control of the heart is mediated through both the sympathetic and parasympathetic nervous systems. The sympathetic pathway passes through the spinal cord, synapses in a group called a ganglia, and then continues on to innervate the heart. When excited, these fibers stimulate the heart rate (tachycardia) as well as the strength of the contraction (controlled by altering the myocardial contractility). The parasympathetic innervation is mediated through cranial nerve X, called the vagus, which originates in a portion of the medulla called the vasomotor center. It slows the heart (bradycardia) by inhibiting the sino-atria node from initiating a heartbeat.

These two nervous pathways control the heart rate for relatively short time periods. For example, the alarm clock rings and you jump out of bed. What keeps the blood pumping to your heart and brain and not to your feet?

A number of reflexes send nervous information to the brain. One such reflex is the baroreceptor—certain receptors in the circulatory system, such as those located in the carotid and aortic bodies, are sensitive to pressure. When the blood pressure gets too low, their rate of firing slows, indicating to the brain that the pressure needs to be increased. If their rate of firing is too fast, the pressure is too high, so the brain is told to slack off.

The cardiac accelerator nerves secrete norepinephrine and the adrenal medulla secretes epinephrine (adrenaline), increasing the heart rate and raising the blood pressure. The vagus secretes acetylcholine, which slows the heart rate.

Starling's Law of the Heart is a mechanical approach—it says all the blood pumped to the heart must leave the heart. If you increase the venous return (the amount of blood returning to the heart via the veins), then the heart must pump all that blood. Otherwise, your veins would quickly become distended. This reflex is important in long-term control of the heart.

The lungs' job is to exchange used gases from the blood with fresh gases from the outside air. The functional unit of the lung, an alveoli, is shaped like a very small grape. A thin membrane surrounds this alveoli; through this membrane, carbon dioxide diffuses from high (in the capillary blood) to low (in the alveoli) concentration; oxygen diffuses from high (alveoli) to low (capillary blood) concentration. Once in the blood, oxygen is carried by hemoglobin to the tissues, and carbon dioxide is carried back from the tissues.

The distribution of blood changes with demand. When you eat, more blood goes to your stomach and liver; when you run, the amount of blood to these organs is greatly reduced and the amount of blood going to the working muscles increases tremendously. Normally, the veins, liver, and spleen serve as a reservoir of blood for when it is needed. The brain receives a constant 25 percent of the blood flow regardless of activity.

The Effects of Exercise

The anticipation of a workout usually raises the heart rate and blood pressure a little. When you begin exercising, though, the amount of blood returning to your heart is greatly increased—the blood reservoir is mobilized. This increases the heart rate. Even the breathing rate has an effect on heart rate. As work output increases, the nervous system also has a role in controlling the flow of blood to the muscles and away from organs such as the liver and stomach, a process called blood shunting. The adrenal medulla is called upon to release epinephrine, which further increases heart rate and causes vasoconstriction of the peripheral vessels, also improving shunting. As you can see, a variety of mechanisms increase blood flow through working muscles to supply oxygen and nutrients and remove wastes.

The body is a lazy critter—it will work, and improve the mechanics and abilities of its parts, but only under duress. If little stress is placed on the body, it adapts to this life of leisure. If strenuous activity is placed on the body, and the body is allowed to adapt, it does so

```
10 REM    ******  AEROBICS  ******
20 CLS:PRINT"AEROBICS PROGRAM BY"
30 PRINT"BRUCE POWEL DOUGLASS"
40 INPUT"ENTER TIME OF RUN IN MINUTES, SECONDS";M,S
50 INPUT"ENTER DISTANCE IN MILES";D
60 TIME=M+S/60:' TIME IN MINUTES (DECIMAL FORM)
70 PTS=10.6181*D-.554151*TIME-1.21753
80 PRINT"AEROBIC POINTS EARNED =";PTS
90 PRINT"AVERAGE MILE TIME (MIN/MILE) ";TIME/D
100 PRINT"AVERAGE VELOCITY (MPH) ";D/TIME*60
110 INPUT"ENTER YOUR 5-MINUTE RECOVERY HEART RATE";HR
120 IF HR>120 THEN PRINT"YOUR RECOVERY IS NOT ADEQUATE - SLOW DO
WN OR REDUCE SPEED!" ELSE PRINT"GOOD RECOVERY! DISTANCE AND SPEE
D NOT EXCESSIVE"
130 END
```

Program Listing 1

Program Listing 2

```
10 REM   ******   AUTOHART   ******
20 REM   *        WRITTEN BY       *
30 REM   * BRUCE POWEL DOUGLASS    *
40 REM   * DEPT. PHYSIOLOGY        *
50 REM   * USD MEDICAL SCHOOL      *
60 REM   ***************************
70 CLEAR 300:DEFUSR=&HFF00:DEFINT P,I,Z:DIM B(60),Z(200),Y(200),
X(200):'Z IS WHERE THE BEAT TIMES ARE STORED
80 U1$="#####     #.#####    ###.#####"
90 CLS:PRINT TAB(15);"AUTOHART BY BRUCE POWEL DOUGLASS"
100 PRINT TAB(20)"INSTRUCTIONS:"
110 PRINT"THE MACHINE LANGUAGE PROGRAM HEART/CMD MUST"
120 PRINT"ALREADY BE IN MEMORY. LINE 70 IS REQUIRED"
130 PRINT"YOU SHOULD TAKE YOUR CAROTID PULSE AT THE SIDE"
140 PRINT"OF YOUR NECK, JUST LATERAL TO THE TRACHEA AT THE"
150 PRINT"CAROTID ARTERY. EVERYTIME YOU FEEL A BEAT, PRESS"
160 PRINT"THE <ENTER> KEY. TO TERMINATE DATA ENTRY, PRESS THE"
170 PRINT"<BREAK> KEY. THE PROGRAM WILL THEN DISPLAY AND"
180 PRINT"PERFORM AUTOCORRELATION ON THE TIME SERIES. TAKE"
190 PRINT"YOUR PULSE FOR 1 TO 2 MINUTES. IF YOU WANT TO DO IT"
200 PRINT"LONGER, THE ARRAY IN LINE 70 MUST BE DIMENSIONED BIGGE
R."
210 PRINT"IT WILL PROBABLY TAKE A FEW ATTEMPTS TO BE PROFICIENT"

220 PRINT"AT TAKING YOUR PULSE AND PRESSING A KEY.
                    PRESS ANY KEY TO START"
230 A$=INKEY$:'CLEAR INKEY$ BUFFER
240 A$=INKEY$:IF A$="" THEN 240
250 CLS:PRINT@515,"<ENTER> TO ENTER HEART BEAT, <DOWN ARROW> TO
ANALYSE"
260 A=USR(0)-1:'COLLECT THOSE POINTS INTO Z(I); A=NUMBER OF ENTR
IES
270 DIM M(A):' TO HOLD MOVING AVERAGES LATER
280 ' THE ASSEMBLY ROUTINE TAKES 33.258 MICROSEC PER LOOP
290 ' PLUS THE TIME DELAY (TO REMOVE YOUR FINGERS) OF 0.15 SEC
300 ' LEAVES THE EQUATION (DIVIDE BY 1.0 E+6 TO GET SECONDS)
310 CO=33.258/1E6:' CONSTANT FOR TURNING IT INTO SECONDS
320 TIME=0:FOR I=1 TO A
325 IF Z(I)<0 THEN Y(I)=CO*(65535+Z(I))+0.15
330 Y(I)=CO*Z(I)+0.15:'  Y(I)=INTERVAL IN SECONDS
340 IF Y(I)>0 THEN HR=HR+Y(I):' FOR AVERAGE HEART RATE
350 IF MY<Y(I) THEN MY=Y(I)
360 TIME=TIME+Y(I):'TOTAL TIME
370 X(I)=TIME:'CUMULATIVE TIME
380 PRINT USING U1$;Z(I);Y(I);TIME
390 NEXT I:HR=A/HR*60
400 ZZ=3*(TIME+1):DIM Z2(ZZ)
410 CLS:PRINT"YOU HAVE COLLECTED ";A;" POINTS OVER ";TIME;" SECO
NDS"
420 PRINT"AVERAGE HEART RATE IS ";HR;" BEATS/MINUTE"
430 REM TRANSFORM THE DATA FROM BEAT INTERVALS
440 REM TO A TRUE TIME SERIES OF '1' IF BEAT, '0' IF NOT
450 REM THE PLOT IS A CHR$(188) IF ON, CHR$(176) IF OFF
460 A2$=CHR$(188):A1$=CHR$(176)
470 PRINT TAB(20);"PLOT OF 1/3 SECOND INTERVALS"
480 J=1:STP=1/3
490 FOR K=0 TO TIME STEP STP
495   IF K<X(J) THEN PRINT A1$;:Z2(K*3)=0:GOTO 510
500   IF X(J)<=K THEN Z2(K*3)=1:PRINT A2$;:J=J+1:GOTO 500
510 NEXT K:PRINT:A$=INKEY$
520 PRINT TAB(20);"PRESS ANY KEY TO CONTINUE";
530 A$=INKEY$:IF A$="" THEN 530
540 REM AUTO-CORRELATION
550 REM COMPUTES AUTOCORRELATION WITH PHASE SHIFT FROM 0 TO 20 S
ECONDS AT 1/3 SECOND INTERVALS
560 REM  B(I) HOLDS THE 'BINS' FOR THE SUMS
570 REM NOTE THE SIMPLIFICATION SINCE WE ARE DEALING WITH
580 REM A 0=NO BEAT, 1=BEAT
590 CLS:FOR PH=1 TO 60:' 60 INTERVALS OF 1/3 SEC EACH
600   PRINT@0,"WORKING ON PHASE ";PH
610   FOR I=1 TO A
620       IF I+PH>ZZ THEN 650
630       B(PH)=B(PH)+Z2(I)*Z2(I+PH)
640   NEXT I
650   IF MX<B(PH) THEN MX=B(PH):' MAX HEIGHT
660 NEXT PH
670 REM NOW PLOT IT, BUT FIRST SCALE IT FOR SCREEN
680 NM=40/MX:'MAX HEIGHT=40 UNITS
690 CLS:PRINT"AUTO-CORRELOGRAM OF DATA <> PRESS ANY KEY TO CONTI
NUE"
700 FOR I=1 TO 60
710   B(I)=B(I)*NM
720   FOR J=47 TO 47-B(I) STEP -1
730     SET(I+16,J)
740   NEXT J
750 NEXT I
760 A$=INKEY$:IF A$="" THEN 760
770 REM MOVING AVERAGES OF THE INSTANTANEOUS FREQUENCY
780 REM 1/Y(I)
790 CLS:INPUT"ENTER THE ORDER OF THE MOVING AVERAGES";MA
800 PRINT"THINKING  ";
810 FOR I=1 TO A-MA:SUM=0
820   FOR J=1 TO MA
830     PRINT".";
840     Y=Y(I+J-1)
850     IF Y=0 THEN 870
860     SUM=SUM+Y
870   NEXT J
880   M(I)=SUM/MA
890   IF MM<M(I) THEN MM=M(I)
900 NEXT I
```

Listing 2 continues

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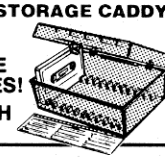

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Listing 2 continued

```
910 REM NOW A LONGITUDINAL PLOT OF BOTH INTERVAL AND SMOOTHED IN
TERVALS Y(I) AND M(I)
930 IF MM>MY THEN SC=MM ELSE SC=MY
940 SC=50/SC:'SCALING FACTOR FOR LINE PRINTER OUTPUT
950 LPRINT CHR$(27);CHR$(78);:' THIS SETS THE ITOH 8510 PRINTER
TO 10 CPI MONOSPACE FONT - MAY NOT BE NEEDED ON YOUR PRINTER
960 ' IF YOU WANT TO SEND THIS TO THE SCREEN AND NOT THE PRINTER
,
970 ' THEN JUST CHANGE ALL THE LPRINTS TO PRINTS.
980 TP$="TIME :"+STRING$(51,"-")+":":LPRINT TP$
990 FOR I=1 TO A-MA
1000   Y=Y(I):IF Y=0 THEN 1040
1005   M=M(I)
1010   LPRINT USING "#### :";I;
1020 '  #=SMOOTHED DATA, 0=UNSMOOTHED DATA
1030   IF Y<M THEN LPRINT TAB(Y*SC+1);"0";TAB(M*SC+1);"#";
1040   IF M<Y THEN LPRINT TAB(M*SC+1);"#";TAB(Y*SC+1);"0";
1050   LPRINT TAB(57);":"
1060 NEXT I
1070 LPRINT TP$
1080 CLS:PRINT TAB(20);"OPTIONS:"
1090 PRINT"1. REDISPLAY OUTPUT RESULTS"
1100 PRINT"2. REDO MOVING AVERAGES"
1110 PRINT"3. END PROGRAM"
1120 A$=INKEY$:IF A$=""THEN 1120 ELSE ON VAL(A$) GOTO 410,790,11
40
1130 GOTO 1120
1140 END
```

Program Listing 3

```
5 GOTO 9000:REM LEVEL ii VERSION
10 REM   ******   LVII-HART   ******
20 REM   *       WRITTEN BY        *
30 REM   * BRUCE POWEL DOUGLASS    *
40 REM   * DEPT. PHYSIOLOGY        *
```

Listing 3 continues

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Listing 3 continued

```
50 REM   * USD MEDICAL SCHOOL       *
60 REM   ***************************
70 CLEAR 300:POKE 16527,127:POKE16526,0:DEFINT P,I,Z:DIM B(60),Z
(200),Y(200),X(200):'Z IS WHERE THE BEAT TIMES ARE STORED
80 U1$="#####     #.#####     ###.#####"
90 CLS:PRINT TAB(15);"AUTOHART BY BRUCE POWEL DOUGLASS"
100 PRINT TAB(20)"INSTRUCTIONS:"
110 PRINT"THE MACHINE LANGUAGE PROGRAM HEART/CMD MUST"
120 PRINT"ALREADY BE IN MEMORY. LINE 70 IS REQUIRED"
130 PRINT"YOU SHOULD TAKE YOUR CAROTID PULSE AT THE SIDE"
140 PRINT"OF YOUR NECK, JUST LATERAL TO THE TRACHEA AT THE"
150 PRINT"CAROTID ARTERY. EVERYTIME YOU FEEL A BEAT, PRESS"
160 PRINT"THE <ENTER> KEY. TO TERMINATE DATA ENTRY, PRESS THE"
170 PRINT"<BREAK> KEY. THE PROGRAM WILL THEN DISPLAY AND"
180 PRINT"PERFORM AUTOCORRELATION ON THE TIME SERIES. TAKE"
190 PRINT"YOUR PULSE FOR 1 TO 2 MINUTES. IF YOU WANT TO DO IT"
200 PRINT"LONGER, THE ARRAY IN LINE 70 MUST BE DIMENSIONED BIGGE
R."
210 PRINT"IT WILL PROBABLY TAKE A FEW ATTEMPTS TO BE PROFICIENT"

220 PRINT"AT TAKING YOUR PULSE AND PRESSING A KEY.
                    PRESS ANY KEY TO START"
230 A$=INKEY$:'CLEAR INKEY$ BUFFER
240 A$=INKEY$:IF A$="" THEN 240
250 CLS:PRINT@515,"<ENTER> TO ENTER HEART BEAT, <DOWN ARROW> TO
ANALYSE"
260 A=USR(0)-1:'COLLECT THOSE POINTS INTO Z(I); A=NUMBER OF ENTR
IES
270 DIM M(A):' TO HOLD MOVING AVERAGES LATER
280 ' THE ASSEMBLY ROUTINE TAKES 33.258 MICROSEC PER LOOP
290 ' PLUS THE TIME DELAY (TO REMOVE YOUR FINGERS) OF 0.15 SEC
300 ' LEAVES THE EQUATION (DIVIDE BY 1.0 E+6 TO GET SECONDS)
310 CO=33.258/1E6:' CONSTANT FOR TURNING IT INTO SECONDS
320 TIME=0:FOR I=1 TO A
325 IF Z(I)<0 THEN Y(I)=CO*(65535+Z(I))+0.15
330 Y(I)=CO*Z(I)+0.15:'  Y(I)=INTERVAL IN SECONDS
340 IF Y(I)>0 THEN HR=HR+Y(I):' FOR AVERAGE HEART RATE
350 IF MY<Y(I) THEN MY=Y(I)
360 TIME=TIME+Y(I):'TOTAL TIME
370 X(I)=TIME:'CUMULATIVE TIME
380 PRINT USING U1$;Z(I);Y(I);TIME
390 NEXT I:HR=A/HR*60
400 ZZ=3*(TIME+1):DIM Z2(ZZ)
410 CLS:PRINT"YOU HAVE COLLECTED ";A;" POINTS OVER ";TIME;" SECO
NDS"
420 PRINT"AVERAGE HEART RATE IS ";HR;" BEATS/MINUTE"
430 REM TRANSFORM THE DATA FROM BEAT INTERVALS
440 REM TO A TRUE TIME SERIES OF '1' IF BEAT, '0' IF NOT
450 REM THE PLOT IS A CHR$(188) IF ON, CHR$(176) IF OFF
460 A2$=CHR$(188):A1$=CHR$(176)
470 PRINT TAB(20);"PLOT OF 1/3 SECOND INTERVALS"
480 J=1:STP=1/3
490 FOR K=0 TO TIME STEP STP
495   IF K<X(J) THEN PRINT A1$;:Z2(K*3)=0:GOTO 510
500   IF X(J)<=K THEN Z2(K*3)=1:PRINT A2$;:J=J+1:GOTO 500
510 NEXT K:PRINT:A$=INKEY$
520 PRINT TAB(20);"PRESS ANY KEY TO CONTINUE";
530 A$=INKEY$:IF A$="" THEN 530
540 REM AUTO-CORRELATION
550 REM COMPUTES AUTOCORRELATION WITH PHASE SHIFT FROM 0 TO 20 S
ECONDS AT 1/3 SECOND INTERVALS
560 REM  B(I) HOLDS THE 'BINS' FOR THE SUMS
570 REM NOTE THE SIMPLIFICATION SINCE WE ARE DEALING WITH
580 REM A 0=NO BEAT, 1=BEAT
590 CLS:FOR PH=1 TO 60:' 60 INTERVALS OF 1/3 SEC EACH
600   PRINT@0,"WORKING ON PHASE ";PH
610   FOR I=1 TO A
620       IF I+PH>ZZ THEN 650
630       B(PH)=B(PH)+Z2(I)*Z2(I+PH)
640   NEXT I
650   IF MX<B(PH) THEN MX=B(PH):' MAX HEIGHT
660 NEXT PH
670 REM NOW PLOT IT, BUT FIRST SCALE IT FOR SCREEN
680 NM=40/MX:'MAX HEIGHT=40 UNITS
690 CLS:PRINT"AUTO-CORRELOGRAM OF DATA <> PRESS ANY KEY TO CONTI
NUE"
700 FOR I=1 TO 60
710   B(I)=B(I)*NM
720   FOR J=47 TO 47-B(I) STEP -1
730     SET(I+16,J)
740   NEXT J
750 NEXT I
760 A$=INKEY$:IF A$="" THEN 760
770 REM MOVING AVERAGES OF THE INSTANTANEOUS FREQUENCY
780 REM 1/Y(I)
790 CLS:INPUT"ENTER THE ORDER OF THE MOVING AVERAGES";MA
800 PRINT"THINKING  ";
810 FOR I=1 TO A-MA:SUM=0
820   FOR J=1 TO MA
830     PRINT".";
840     Y=Y(I+J-1)
850     IF Y=0 THEN 870
860     SUM=SUM+Y
870   NEXT J
880   M(I)=SUM/MA
890   IF MM<M(I) THEN MM=M(I)
900 NEXT I
910 REM NOW A LONGITUDINAL PLOT OF BOTH INTERVAL AND SMOOTHED IN
TERVALS Y(I) AND M(I)
930 IF MM>MY THEN SC=MM ELSE SC=MY
940 SC=50/SC:'SCALING FACTOR FOR LINE PRINTER OUTPUT
950 LPRINT CHR$(27);CHR$(78);:' THIS SETS THE ITOH 8510 PRINTER
TO 10 CPI MONOSPACE FONT - MAY NOT BE NEEDED ON YOUR PRINTER
960 ' IF YOU WANT TO SEND THIS TO THE SCREEN AND NOT THE PRINTER
```

Listing 3 continues

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— — — — — — — — — — — — — — — — *month* _____ *year* _____

✓See List of Advertisers on Page 387

Listing 3 continued

```
970 ' THEN JUST CHANGE ALL THE LPRINTS TO PRINTS.
980 TP$="TIME :"+STRING$(51,"-")+":":LPRINT TP$
990 FOR I=1 TO A-MA
1000   Y=Y(I):IF Y=0 THEN 1040
1005   M=M(I)
1010   LPRINT USING "#### :";I;
1020 '  #=SMOOTHED DATA, 0=UNSMOOTHED DATA
1030   IF Y<M THEN LPRINT TAB(Y*SC+1);"0";TAB(M*SC+1);"#";
1040   IF M<Y THEN LPRINT TAB(M*SC+1);"#";TAB(Y*SC+1);"0";
1050   LPRINT TAB(57);":"
1060 NEXT I
1070 LPRINT TP$
1080 CLS:PRINT TAB(20);"OPTIONS:"
1090 PRINT"1. REDISPLAY OUTPUT RESULTS"
1100 PRINT"2. REDO MOVING AVERAGES"
1110 PRINT"3. END PROGRAM"
1120 A$=INKEY$:IF A$=""THEN 1120 ELSE ON VAL(A$) GOTO 410,790,11
40
1130 GOTO 1120
1140 END
9000 REM ROUTINE TO POKE THE MACHINE LANGUAGE PROGRAM HEART/ASM
9010 REM INTO MEMORY FOR LEVEL ii FOLKS
9020 AD=32512:'&H7F00 IN MEMORY
9030 FOR I=AD TO 32602
9040 READ A:POKE I,A
9050 NEXT I
9060 REM MAKE SURE MEMORY SIZE IS SET TO BELOW 7F00H
9070 M=32500:MS=PEEK(16561)+PEEK(16562)*256+1:IF MS>M THEN POKE
16562,M/256:POKE16561,M-INT(M/256)*256
9080 GOTO 70
10000 DATA  243, 62, 42, 50, 0, 60, 33, 86, 255, 205, 13, 38, 21
3, 221, 225, 17, 0, 0, 33, 0
10010 DATA  0, 58, 64, 56, 254, 16, 40, 53, 254, 1, 40, 3, 35, 2
4, 242, 221, 117, 0, 221, 35
10020 DATA  221, 116, 0, 221, 35, 33, 0, 0, 19, 213, 229, 221, 2
29, 1, 255, 39, 205, 96, 0, 221
10030 DATA  225, 225, 209, 58, 0, 60, 254, 191, 40, 4, 62, 191,
24, 2, 62, 32, 50, 0, 60, 24
10040 DATA  196, 213, 225, 195, 154, 10, 90, 40, 48, 41, 0
```

Program Listing 4

```
                00020 ;*************************************************************
                00030 ;*    ASSEMBLED ON MZAL EDITOR/ASSEMBLER                     *
                00040 ;*  THE PROGRAM STORES THE TIME INTERVAL BETWEEN             *
                00050 ;*  HEART BEATS EACH TIME THE <ENTER> KEY IS PRESSED.        *
                00060 ;*  THE PROGRAM RETURNS TO BASIC WHEN YOU PRESS THE          *
                00070 ;*  <BREAK> KEY. NO PARAMETERS NEED BE PASSED FROM BASIC     *
                00080 ;*  BUT THE Z(I) ARRAY MUST BE DECLARED TO BE AT LEAST 200 *
                00090 ;*  ELEMENTS => AND <= BE INTEGERS                           *
                00100 ;*  ON EXIT, HL HAS THE NUMBER OF BEATS STORED               *
                00110 ;*************************************************************
                00120 ;
FF00            00130          ORG     0FF00H  ;UP IN THE MEMORY STRATOSPHERE
3840            00140 KEYBRD   EQU     3840H   ;KEYBOARD LOCATION FOR <ENTER>
                00140                          ;<DOWN ARROW>, ETC
260D            00150 VARPTR   EQU     260DH   ;ROM CALL TO LOCATE VARIABLE
0A9A            00160 BASIC    EQU     0A9AH   ;BASIC REENTRY POINT
0060            00170 DELAY    EQU     0060H   ;DELAY TO AVOID REPEAT CHARACTERS
3C00            00180 SCREEN   EQU     3C00H   ;VIDEO MEMORY
0001            00000 ENTER    EQU     1       ;<ENTER> KEY
0010            00000 DOWN     EQU     16      ;<DOWN ARROW> KEY
FF00 F3         00190          DI              ;DISABLE INTERRUPTS
FF01 3E2A       00200          LD      A,'*'
FF03 32003C     00210          LD      (SCREEN),A
FF06 2156FF     00220          LD      HL,ARRAY ;VARIABLE NAME TO REFERENCE
FF09 CD0D26     00230          CALL    VARPTR  ;GET ADDRESS OF Z(0)
FF0C D5         00240          PUSH    DE      ;DE HAS ADDRESS
FF0D DDE1       00250          POP     IX      ;NOW IN IX REGISTER PAIR
FF0F 110000     00260          LD      DE,00H  ;INITIALIZE # OF BEATS
FF12 210000     00270          LD      HL,00H  ;INITIAL COUNT FOR HEART BEAT
FF15 3A4038     00280 LOOP     LD      A,(KEYBRD)
FF18 FE10       00290          CP      DOWN    ;<DOWN ARROW> KEY TO QUIT
FF1A 2835       00300          JR      Z,BACK  ;RETURN IF <DOWN ARROW> KEY
FF1C FE01       00310 CONT     CP      ENTER   ;<ENTER> KEY?
FF1E 2803       00320          JR      Z,STASH ;STORE HEART BEAT COUNT
FF20 23         00330          INC     HL      ;UPDATE COUNTER
FF21 18F2       00340          JR      LOOP    ;IF NOT EITHER, THEN LOOP
FF23 DD7500     00350 STASH    LD      (IX),L  ;STORE LSB
FF26 DD23       00360          INC     IX      ;UPDATE POINTER
FF28 DD7400     00370          LD      (IX),H  ;STORE MSB
FF2B DD23       00380          INC     IX      ;UPDATE POINTER
FF2D 210000     00390          LD      HL,00H  ;ZERO COUNTER
FF30 13         00400          INC     DE      ;UPDATE BEAT COUNTER
                00410 ; THIS NEXT ROUTINE DELAYS FOR ABOUT 1/10 SECOND
```

Listing 4 continues

by improving its functions.

The heart responds to exercise during exercise by increasing the strength of each contraction (so that the chambers of the heart are emptied more completely each beat) and by increasing the rate of the contractions. The increase in heart rate may be as dramatic as 40 to 200, or an increase of 500 percent. The stroke volume (the amount of blood pumped each contraction) increases as well, although less dramatically—usually 10 to 35 percent. After a heart rate of about 180, stroke volume will actually decrease because the heart doesn't have time to adequately fill before the next beat is due. In well-trained athletes, the cardiac output (stroke volume times heart rate) can increase six- to sevenfold during severe exercise.

In the long term, the heart becomes stronger. The chamber walls thicken, providing more muscle power for the expulsion of blood into the waiting aorta. Therefore, it does not have to beat as often to supply enough blood to the body. Most, but not all, people find their resting heart rates decrease after a few months of regular endurance exercise. (My resting pulse rate stabilizes at 40 to 45 beats per minute when I'm in shape, and after a few weeks of inactivity returns to 65 to 70 beats per minute.) Jim Ryun had a resting heart rate of 72 beats per minute when he held the world record in the mile, though.

To take your heart rate, use either the autocorrelation program (presented later in this column) or a watch. Place a finger or two on the radial or brachial arteries on the wrist, or better, on the carotid artery on the neck, just beside the trachea. Count the number of beats in 10 seconds, and multiply by 6. You should take your resting heart rate before getting out of bed in the morning.

Muscles get better with use, too. Running and other such endurance exercises will not increase muscle mass, as heavy strength exercises will. In fact, they may decrease the size of a limb by using up fat stores in and around the muscle. Research by Dr. William Winder, here at the University of South Dakota, has shown that with a minimum of about one hour per day the enzymes involved in electron transport (oxidative phosphorylation) will increase. The muscles also increase in myoglobin, a cousin of hemoglobin. The capillaries (tiny blood vessels where the exchange of gases, nutrients, and waste products with the working tissues

TRS-80* APTITUDE TEST STUDY GUIDE

Reading and Comprehension Sample Question

***READ* the short piece below and *ANSWER* the question that follows.**

WHY I SUBSCRIBE TO 80 MICRO

Before I read my first issue of 80 MICRO I thought, "What's all the fuss about? It's just another microcomputing magazine, isn't it?" Sure I knew that 80 MICRO had published an awful lot of pages of TRS-80 information (10,000 in its first three years), but I had assumed most of it was filler, just like those other computer magazines.

Boy, was I wrong! One day, while at a friend's house, I happened to see a copy of 80 MICRO lying on his coffee table, I picked it up and began to read. I immediately realized that 80 MICRO was no ordinary micro magazine. That one issue provided me with more useful information on my TRS-80 than any other single source I had ever read. It was just packed with features like honest reviews of hardware and software, dozens of programs for business or pleasure, and page after page of money-saving ads. (I saved hundreds of dollars on computer-related purchases in the first year of my subscription ALONE.) I went out and bought my own copy of the magazine that very day. And I've been a regular subscriber ever since.

QUESTION 1: Why does this TRS-80 user subscribe to 80 MICRO? (More than one answer may be correct. Circle the answer which is *most* correct.)

a) 80 MICRO provides him with more useful information than any other single source—over 10,000 pages in the first three years.

b) He finds dozens of practical and enjoyable programs in each and every issue of 80 MICRO.

c) 80 MICRO's hardware and software reviews give him the truth, the whole truth, and nothing but the truth.

d) The ads in 80 MICRO save him literally hundreds of dollars on computer-related purchases every year.

e) All of the above.

The correct answer is: e) All of the above.

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Listing 4 continued

```
                00420 ; TO GIVE YOU A CHANCE TO GET YOUR GRUBBY FINGERS OFF
                00430 ; THE <ENTER> KEY
FF31 D5         00440          PUSH    DE       ;SAVE REGISTERS
FF32 E5         00450          PUSH    HL
FF33 DDE5       00460          PUSH    IX
FF35 01FF27     00470          LD      BC,27FFH
FF38 CD6000     00480          CALL    DELAY    ;DELAY FOR 0.150 SECONDS
FF3B DDE1       00490          POP     IX
FF3D E1         00500          POP     HL
FF3E D1         00510          POP     DE
FF3F 3A003C     00520          LD      A,(SCREEN)
FF42 FEBF       00530          CP      191      ;GRAPHICS BLOCK
FF44 2804       00540          JR      Z,SPACE  ;IF SO PUT A SPACE
FF46 3EBF       00550          LD      A,191
FF48 1802       00560          JR      CONT2
FF4A 3E20       00570 SPACE    LD      A,32
FF4C 32003C     00580 CONT2    LD      (SCREEN),A
FF4F 18C4       00590          JR      LOOP     ;BACK TO BUSINESS
FF51 D5         00600 BACK     PUSH    DE       ;NUMBER OF BEATS STORED
FF52 E1         00610          POP     HL       ;
FF53 C39A0A     00620          JP      BASIC    ;BACK TO BASIC
FF56 5A283029   00630 ARRAY    DEFM    'Z(0)'   ;ARRAY TO STICK THE POINTS IN
FF5A 00         00640          DEFB    00H      ;END WITH A ZERO
                00650 ;THE ARRAY MUST BE DEFINED BY BASIC BEFORE THIS ROUTINE
                00660 ;IS CALLED. IT SHOULD BE DIMENSIONED TO AT LEAST 200
                00670 ;ELEMENTS WITH THE STATEMENT SO YOU WON'T RUN OUT OF ROOM
                00680 ;        DEFINT Z:DIM Z(200)
402D            00690          END     402DH    ;
```

occurs) also increase in number. The number of capillaries in the gastrocnemeous (calf) muscle has been found to increase by up to 600 percent!

Many other interesting changes take place as a result of endurance exercise. The amount of high-density lipoproteins (HDLs) in the blood increase, which is related to a decrease in the rate of cardiac failure. The level of HDLs seems to be a better indicator of myocardial infarction risk than cholesterol levels. Further, the blood gets "thicker," increasing the number of red blood cells and the amount of hemoglobin in the cells (thus improving the blood's ability to carry oxygen and carbon dioxide). Your ability to tolerate metabolic waste products also improves with training. Consult Guyton's *Textbook of Medical Physiology* or Per Olf Ostran's *Textbook of Exercise Physiology* if you're interested in the specifics.

Measuring Your Fitness

You may be familiar with Dr. Cooper's book, *The New Aerobics*. The book uses an aerobic-point scale to measure work done. Distance and time are both important for determining the stress effect on the cardiovascular system. His book presents tables of interpolated data of points versus time and distance. I contacted Dr. Cooper's lab for the equation they use in determining the number of points per time and distance, and was informed that they would be happy to send it to me, for a mere $1,500. Since I figured the editors at *80 Micro* wouldn't be too keen on that expense, I simply took a representative number of points from the table and with a regression program, I made my own:

$$\text{POINTS} = 10.6181 * \text{distance} - .554151 * \text{time} - 1.21753$$

where the distance is in miles and the time is in minutes.

Cooper recommends 30 points per week as a minimum for reaching an adequate state of fitness. Think of the points as a measure of the stress placed on the body that demands adaptation of the cardiovascular and muscular systems. They are related to energy output, but since it takes as much energy to walk 10 miles as it does to run it, you can see that the amount of energy per unit time is a more important criterion for fitness. Thus, running a mile gives more points than walking the same mile, and running 10 miles at eight minutes per mile gives more points than running five miles at the same pace.

(Of course, I know all true computer programmers are in excellent physical shape, but if you're over 30 and haven't worked out for a while, don't start running right away without a doctor's approval. It takes time to be macho.)

Program Listing 1 (Aerobics) asks for the beginning and ending time for your run, the distance you covered, your resting heart rate, rate at the finish of the run, and heart rate five minutes after the finish. It will calculate the aerobic points (according to the equation derived above) and average velocity, and will caution you if your five-minute pulse is not adequate.

You should take some precautions. Running has an incredible injury rate for a noncontact sport—it is stressful on the heart and circulatory systems, and also on the muscles, tendons, ligaments, and joints. For this reason, you should always warm up and warm down thoroughly and stretch constantly to avoid shortening the muscles by using them in a shortened range of motion (running). If you follow a good plan of stretching and warming up and down, you should be able to avoid much of the trouble plaguing many runners—particularly if you are a low-mileage runner (under 40 miles per week).

Your pulse should normally go above 150 during the course of the run, but it will not improve your fitness to go beyond 180. Determine this pulse rate by pressing your fingers either to the carotid artery beside the trachea or the radial or ulnar artery of the wrist, counting the number of pulses in 10 seconds and multiplying by 6. During your warm-down, walk around and stretch, and five minutes after the finish of the run, take your pulse again. It should be below 120 (20 beats in 10 seconds). If it is not, then your run was too hard, and you should slow down.

Statistical Analysis

Now let's consider time-series analysis with moving averages and autocorrelation. Autocorrelation is simply the correlation of a time series with itself. But shouldn't a time series have a high correlation with itself?

A time series is a collection of data points collected at various points in time. An ECG (electrocardiogram) monitors the heart rate (and electrical vectors), for example, and produces a series of data points—a time series. A plot of stock market prices over a period of time is also a time series. Two questions are often asked about time series:

- Is there a periodic (seasonal) aspect to the series?
- Is there an overall trend in the series?

Autocorrelation will determine periodic fluctuations in the time series; moving averages will remove the periodic fluctuations and reveal the overall trend. In this sense, the two functions are opposites. I'll discuss autocorrelation first.

If you imagine a time series consisting of two states (0 and 1) and display the values (0's are shown as spaces), you get something looking like Fig. 1.

If you wanted to perform a correlation, you could align the series with itself, and compare states. If for a given time, both are on or both are off, then

add in a 1 into the correlation sum; if not, then add in a 0. That looks something like Fig. 2.

Of course, this correlation is perfect, as you would expect. Remember that the equations for correlations are:

$$r = \frac{\Sigma(xy)}{\sqrt{(\Sigma x^2 \Sigma y^2)}}$$

where:

$$\Sigma xy = \Sigma XY - \frac{\Sigma X \, \Sigma Y}{N}$$

$$Ex^2 = \Sigma X^2 - \frac{(\Sigma X)^2}{N}$$

$$\Sigma y^2 = \Sigma Y^2 - \frac{(\Sigma Y)^2}{N}$$

X and Y = raw scores

Autocorrelation is just a special case of the garden-variety product/moment correlation. You can see that from these equations the autocorrelation function (since X and Y are the same) reduced down to unity. Not very interesting, is it?

But something interesting happens if you move the series over a bit—see Fig. 3.

"Autocorrelation will determine periodic fluctuations in the time series."

Now you no longer have a perfect correlation! You made a copy of the original time series, and then added a constant to the time for each interval. Watch what happens when you move it over more (see Fig. 4). You moved it over and regained the perfect correlation! How did that happen?

The amount you moved the series over is called the *phase shift* of the series. In autocorrelation, you correlate a series with itself, but add various phase shifts to the correlation to discover periodicities in the data. Normally, the equation for autocorrelation takes a slightly different format that the normal correlation equation because you are correlating one time series with itself, but at different time-phase shifts:

$$\Phi(p) = \frac{1}{2N+} \sum_{i=-N}^{i=N} f(i)(i+p)$$

You can see the autocorrelation function $\Phi(p)$ (where p is the phase shift) is a function of phase shift. By changing the phase shift, you can determine the periodic fluctuations in the data.

Autohart (Program Listing 2) monitors your heart rate and then performs an autocorrelation on it. The output is a histogram (called an autocorrelogram) on the screen. Since the heart rate is fairly regular, you should get a nice big peak at the fundamental heart rate, but you will notice a second peak at about 20 times per minute. That is from the breathing rhythm, which affects heart rate. Since it is also periodic, you will get another peak farther away from the center.

The autocorrelogram is often displayed with only positive phase shifts, since it will be symmetrical about p = 0. There is no reason why you cannot perform an autocorrelation with real, continuous functions, such as commodity prices. The autocorrelation function gives you essentially the same information as the Discrete Fourier Transform, although in a somewhat different format.

Moving averages does the opposite to autocorrelation—it removes periodic fluctuation in a type of data smoothing and reveals an overall trend devoid of

```
1 1  111 1 1   111 1 1   111 1 1   111
```

Figure 1

```
1 1  111 1 1   111 1 1   111 1 1   111
1 1  111 1 1   111 1 1   111 1 1   111
```

Figure 2

```
1 1  111 1 1   111 1 1   111 1 1   111
  1 1  111 1 1   111 1 1   111 1 1   111
```

Figure 3

```
1 1  111 1 1   111 1 1   111 1 1   111
        1 1  111 1 1   111 1 1   111 1 1   111
```

Figure 4

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MICRO MINT

the periodicities. Moving averages will remove only those periodicities that you tell it to remove—it is like passing your time-series data through a filter to remove some noise, or unwanted information. In fact, this data filter is called a low-pass filter.

If you begin with a set of numbers X(1), X(2), X(3),... the moving average of order N is defined to be the sequence of means shown in Fig. 5. If you set Y = M(X) (the series Y(i) is the moving average of the series X(i)), the Y series will be smoothed, since each number in the X series is replaced by the arithmetic mean of the ith through the (i + n − 1)th data points in the X series. This will effectively filter out periodic fluctuations with a frequency higher than the filter (N). In this way, the moving averages filter reduces the amount of variation present in a set of data, specifically, the periodic fluctuations with a higher frequency than the order of the moving average. This process will reduce the number of data points in a manner dependent on the order of the moving average (number of raw data points − order of moving average).

The Autohart program (see Listings 2 and 3) gathers time series data about your heart beats and finds the periodic fluctuations in it (via autocorrelation) and the overall trend (via moving averages). There should be two periodic fluctuations, as shown in the autocorrelogram—from the period of the heart beat itself, and another due to the influence of the respiratory feedback inhibition on the heart rate.

Autohart is easy to use—I've included both a disk and a Level II version. For disk users, assemble the machine-language routine HEART/ASM to sit at FF00H. When you enter Basic, make sure the memory size is set to below that. If you have only 32K, then adjust the ORG of HEART/ASM. If you are a Level II user, I have provided an extra routine that takes the data statement equivalent of the program (lines 10000 and up) and POKEs them into memory at 7F00H.

Type run and messages will tell you how to operate the program. The machine-language routine keeps a counter going until you press enter. Then it stores the value of the counter, and starts over. It keeps doing this until you press the down-arrow key. It uses the ROM call VARPTR to find the integer array Z(i), and stores the values there. On return, the HL register pair (and the USR function) have the value of the number of times you pressed the enter key.

Take your heart rate as I described earlier and every time you feel a beat, press the enter key. Take at least 100 beats—it will take a little while to learn how to keep with the pulses. Don't hold the key down very long—the machine-language routine only waits 15/100 seconds before scanning the keyboard again. Press the key and let go. The upper left corner of the screen will toggle a space with a graphics block each time you press it. If it did not change, the routine stored two beats, not one, and you need to let go sooner.

"The moving averages filter is most effective at frequencies close to its order."

When you press the down arrow, Basic takes over and turns the Z(i) integer array into a single-precision array of seconds between beats, and another array of the cumulative time in seconds. Autohart calculates and displays the average heart rate, and then shows a plot of the beats. Each second is divided into thirds. A tall graphics block indicates a heart beat.

Press the enter key, and an autocorrelation will be performed with 60 phase shifts (20 seconds with ⅓-second intervals for the phase shift). You should have at least 100 points to do this, although you can do it with fewer. Then the program draws an autocorrelogram on the screen. Remember, this is the correlation of a time series with itself with various phase shifts. If you're lucky and got enough points with accurate enough timing for your data entry, you should see a second peak in the histogram, showing a periodic fluctuation in heart rate (it should match your respiration rate).

Next, you will be asked for the order of the moving averages. This affects the periodicities that are removed. The moving averages filter is most effective at frequencies close to its order. The program calculates this and performs a longitudinal plot on your printer. The #s are the smoothed series and the 0s are the raw data. If you do not have a line printer, then just change every LPRINT to print. You will then be given the options of reviewing all the statistics or redoing the moving averages with a different order. Try this out and see the effect of the period of the smoothing.

The program has a number of routines that you may find very useful. The autocorrelation routine will scale and plot a histogram of data values. The moving averages plot routine allows you to scale the width of a plot for your line printer and print a looooong plot of lots of data points by scrolling. (It will also work on the screen, although somewhat less effectively.) You cannot use the Tab statements to tab beyond 64 even if your printer has more columns than that (unless you use a Basic that supports this function, such as DOS-PLUS's Disk Basic). Since my printer's default print font is proportional, I output CHR$(27) and CHR$(78) to use a monospace font, in which all the characters take up the same amount of space.

Finally, these two routines for autocorrelation and moving averages can be used to analyze other types of time-series data. I suggest you generate a series with the function Y = X + SIN(X) + RND(0) since it has both a nice trend (Y = X), a nice periodic feature (+ SIN(X)) and a little noise, too (RND(0)). You will find an autocorrelogram showing the periodic nature and a longitudinal plot of the moving average showing the trend.

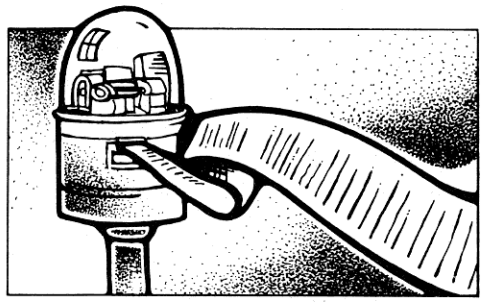
For mathematically inclined readers wishing to learn more about this area of statistical analysis, I recommend the classic *Time-Series Analysis: Forecasting and Control* by George Box and Gwilym Jenkins, popularizers of the ARIMA (Auto Regressive Integrated Moving Averages) model for time-series analysis. Less mathematically sophisticated readers may find *Statistics* by Murray Speigel of Schaum's Outline Series more understandable. ■

$$\frac{X(1)+X(2)+\ldots+X(n)}{N},\ \frac{X(2)+X(3)+\ldots+X(n+1)}{N},\ \frac{X(3)+X(4)+\ldots+X(n+2)}{N},\ldots$$

Figure 5

MONEY DOS

by J.M. Keynes



Expand your opportunities

This is the first anniversary of MONEY DOS. During the last year I have dealt with the basic strategy of investing. I've covered bond analysis, convertible securities, rental property evaluation, IRAs, portfolio analysis, commodity trading, and option trading. My programs were designed to help your investment decision making.

A MONEY DOS hotline was set up with a toll-free number where one could get my 30-second comment about the market. The Hotline following has now grown (late October) to over 1,000 calls each weekend...for good reason. My observations about investing have proven to be sound. For example, those who began calling in March 1982 were surprised to hear my very bearish posture on precious metals, the stock market, and my advice to buy precious metals. The famous gold analyst, James Dines, was telling his subscribers to sell.

They were also surprised when I told the callers in July, "We are on the verge of the most awesome rally in market history," and, "We are seeing lows that we will never see again in our lifetime." Joe Granville, the self-proclaimed market mastermind, was telling his subscribers that the Dow was going much lower!

The September column elicited the most response. I shared a commodity trading system that had averaged over 38 percent profit for 10 years—remember the $50,000 bet! What is important is that the specific recommendations in MONEY DOS have been good. I receive hundreds of letters from callers and writers. An often posed question is why I offer free advice. A recent letter from a man who has closely followed the column and called every weekend states, "For almost a year I have been profiting from your advice and, so far, you haven't tried to sell me a damn thing. There's gotta be a catch somewhere J.M. Why are you writing MONEY DOS?" Well, the catch is that I'm writing a book (my second), which should be released one year hence. The MONEY DOS columns are, generally speaking, excerpts therefrom. Your comments give me valuable insights as to the clarity of my writing. Besides, when it is published, maybe I'll have a few of you interested enough to buy it.

In future columns I shall deal with general investment strategies: buying stocks and paying no commission; arbitrage, the riskless investment; convertible securities; using VisiCalc to obtain a fantastic portfolio analysis; annuities and other ways to defer taxation; short-term option trading; and strategies when interest rates are low. Remember to take into account the two-month lag time from manuscript submission to publication as specific advice may be stale when you read it.

The most exciting new feature to MONEY DOS is the bulletin board system. The idea came from one of my clients, who has had a TRS-80 for three years. With a BBS and the appropriate password my clients can access day or night my latest advice, place an order, check their account status, or ask a question. During market hours they can get a rapid confirmation.

My hardware for the system is a Model III, 48K, currently using an old 80-track Aerocomp drive. When you read this it will be running on a hard drive. I chose the Lynx auto-answer/auto-dial modem for this dedicated service as it has a built-in RS-232. I use MicroSystems' Micro-80 BBS system, which I modified extensively for this service. The parameters are: 300 baud, 7-bit words, 1 stop bit, and even parity.

The BBS operates 24 hours a day, seven days a week. One can see the BBS as 16 file cabinets one on top of the other. The general public has access to cabinets A and B. The balance are reserved for my colleagues and clients. At any time you can access my current recommendations, ask a question, or make suggestions. Should you want to act on the advice, do so at your own risk and place the order through your broker. The public has no access to the Order Entering section. Currently, I am ill-equipped to accept new accounts, even at my minimum.

One section is updated hourly during the market day where one can retrieve *Hotnews* (headlines from wire services), current market averages, commodity prices, signals from The System (see the September 1982 issue), current news on 20 widely held stocks, and my intraday market observations. At 4:30 p.m. (EST) the closing market and commodity prices appear, as well as the options that traded the most volume that day.

At 8 a.m. you can find opening stock trends in Europe, the London gold fixing, and a list of suggested covered-option writes as well as the 10 puts and calls that, based solely on price versus historic volatility, are potentially very profitable, albeit risky. If you see a recommendation on which you want more in-depth information, you can request it. No one will ever call and try to sell you anything—that's a promise. This service is free, save the direct-dial charge you pay Ma Bell.

The maiden voyage began on the 16th of October. Hundreds called the first week, and while I am flattered that they find it so interesting, some stay on for 30–40 minutes retrieving the same information several times. You will save time and money having a printer ready so you can get a printout and read it at your leisure. To print, you must have one of the smart terminal programs. Please limit your access time to 10 minutes. The access number currently is (305) 655-2340. It might be changed when you read this, but a call to the MONEY DOS weekend hotline (800-327-3389, or in Florida 305-655-3389) will update if needed. The hotline operates from 9 p.m. Friday–7 a.m. Monday.

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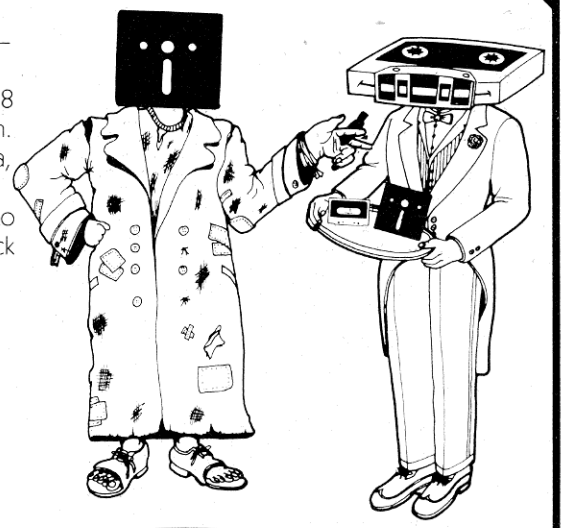

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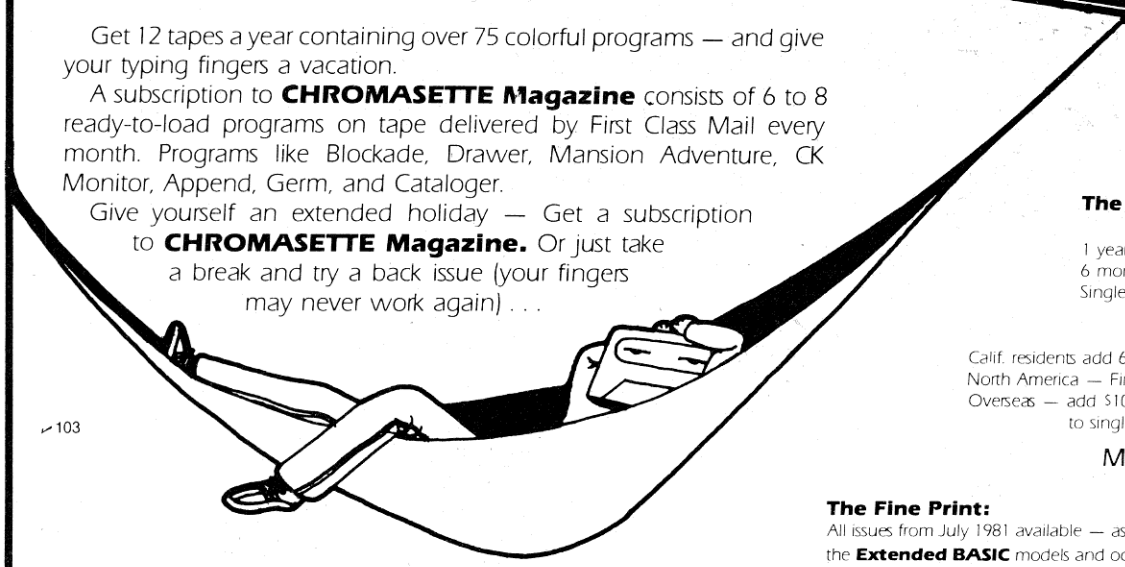

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(The MONEY DOS bulletin board system's access number is currently (305) 655-2340. The MONEY DOS weekend hotline number is 800-327-3389, or in Florida (305) 655-3389.)

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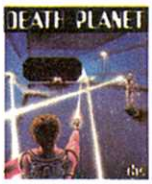

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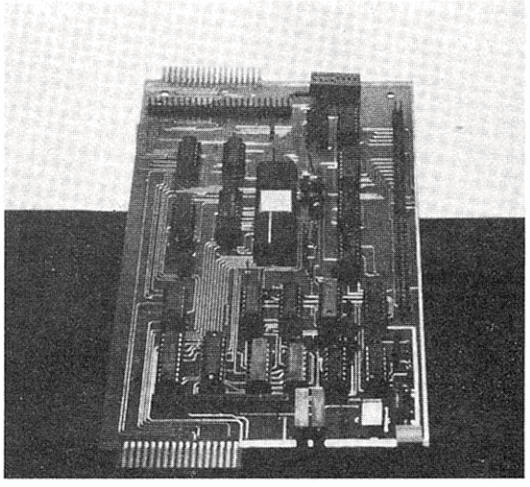

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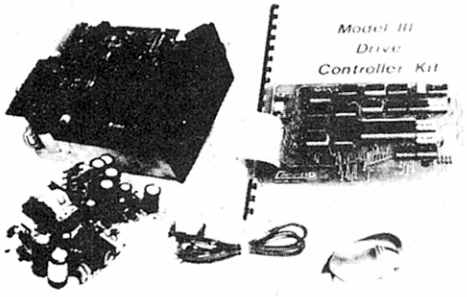

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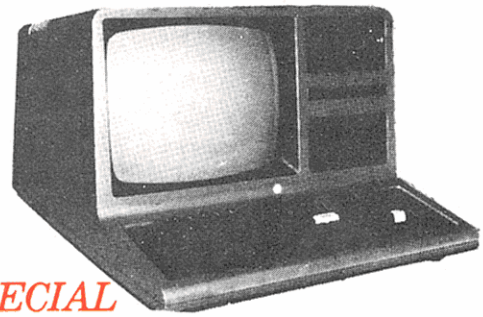

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MODEL III INTERNAL COMMUNICATIONS BOARD

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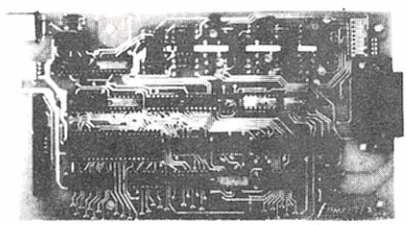

The newest addition to the Computex line of Model III add on kits is our **M3CB1** *Communications board complete with* **RS232 and DIRECT CONNECT MODEM.** *The kit can be supplied in either total kit form or as a partially assembled unit. The partially assembled unit only requires installation of the integrated circuits, all other components have been installed and tested. The* **M3CB1** *mounts in the same location as the Radio Shack RS232 board and installs easily in less than one hour.*

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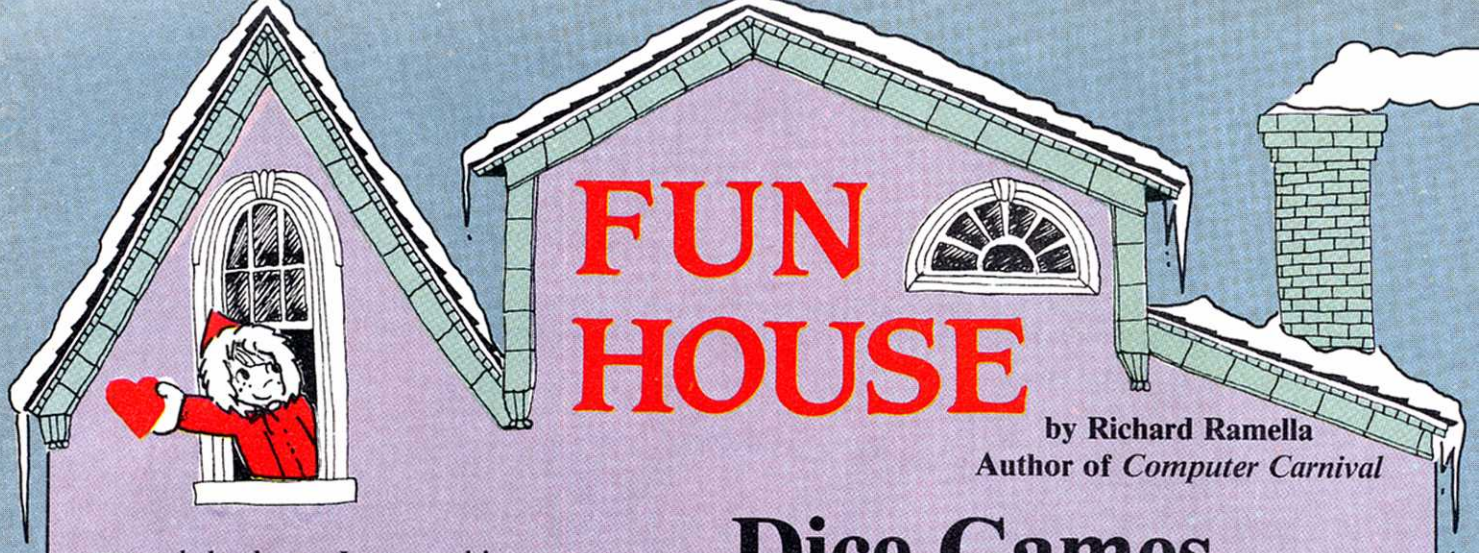

FUN HOUSE

by Richard Ramella
Author of *Computer Carnival*

Dice Games

Stand back as I open this closet door in the game room of the Fun House. Don't be alarmed by what happens next.

Wheee! Out clatter half a million dice. There should be enough for everyone to take five each. We're going to play some dice games, and I'm happy to say that craps is not one of them.

The games are called Fifty, Show Up, Drop Dead, and Martinetti. Separate Color Basic and Level II listings are given for Martinetti, but the program listings for the other three games will work equally well in Level II and on the color machine.

These are games that require only one person and the computer. The computer not only plays against you, but is the scorekeeper and umpire.

Fifty

When I was a kid, like every other kid I had a Monopoly set. As time passed I kept losing parts of the set until I had nothing except the two dice. That's when I was forced to learn some interesting dice games. The first one I learned was Fifty.

I remember Fifty as a tricky game. It turns out it's quite a simple game when the computer keeps score and takes its turns without bragging or complaining.

You and the computer race to see who can score 50 points first. You throw two dice in turn. Only doubles (two ones, two twos, and the like) have any effect on the score. If you throw two sixes, you get 25 points. If you throw two threes, you lose all the points you have. If you throw two ones, two twos, two fours, or two fives, you get five points.

When a player gets a total of 50 or more, the computer says who wins.

Show Up

Again, you and the computer take turns and play against each other. Whereas Fifty was a button-tapping race, Show Up combines strategy and luck.

Both players start with 100 points. Whenever the pot is emptied, the players each give an amount equal to one-tenth of the lowest stake. Example: If

The Key Box

Model I, III or Color Computer
4K RAM

Fifty

```
100 REM * FIFTY / TRS-80 COLOR BASIC AND LEVEL II *
110 CLS
120 FOR Q=1 TO 2
130 IF Q=1 THEN PRINT "YOUR TURN" ELSE PRINT "MY TURN"
140 INPUT "TAP ENTER TO ROLL";X
150 A=RND(6)
160 B=RND(6)
170 PRINT A;B
180 IF A=3 AND B=3 THEN PRINT "LOSE ALL POINTS": T(Q)=0: GOTO 21
0
190 IF A=6 AND B=6 THEN PRINT "25 POINTS": T(Q)=T(Q)+25: GOTO 21
0
200 IF A=B THEN PRINT "5 POINTS": T(Q)=T(Q)+5
210 IF A<>B THEN PRINT "NO SCORE"
220 IF Q=2 THEN PRINT: PRINT: PRINT "SCORE: YOU";T(1);" ME";T(2)
230 PRINT
240 IF T(1)>49 THEN PRINT "YOU WIN": GOTO 290
250 IF T(2)>49 THEN PRINT "I WIN": GOTO 290
260 NEXT Q
270 INPUT "TAP ENTER TO CONTINUE";X
280 GOTO 110
290 GOTO 290
300 END
```

PERIPHERAL VISION

Floppy Disk Services, Inc. is a contracted SIEMENS drive dealer. Do not let the prices fool you, we buy in very large quantities to get the best price and pass that savings on to you! All systems are of the highest grade components and our cabinets are custom designed with you in mind! If not 100% satisfied, call us and we will promptly refund your money. †

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FDD-221-5 5ms step 80 track DD/DS	350.00
TEC SFD-51B 5ms 5¼ 48TPI	215.00
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FD2-1

Show Up

```
100 REM * SHOW UP / TRS-80 COLOR BASIC AND LEVEL II *
110 CLS
120 P(1)=100
130 P(2)=100
140 FOR Q=1 TO 2
150 IF P=0 GOSUB 390
160 IF Q=1 THEN PRINT "YOUR TURN" ELSE PRINT "MY TURN"
170 A=RND(6)
180 PRINT
190 PRINT "YOU";P(1);" ME";P(2);" POT";P
200 PRINT
210 PRINT "THE POINT IS";A
220 IF Q=1 THEN INPUT "YOUR BET";X
230 IF Q=2 GOSUB 470
240 IF X<1 OR X>P(Q) OR X>P THEN PRINT "IMPOSSIBLE": GOTO 220
250 B=RND(6)
260 C=RND(6)
270 IF Q=1 THEN PRINT "YOU "; ELSE PRINT "I ";
280 PRINT "ROLL";B;C
290 IF B>A AND C>A THEN PRINT "WINNER": P(Q)=P(Q)+X: P=P-X
300 IF B<A OR C<A THEN PRINT "LOSE ALL": P(Q)=P(Q)-X: P=P+X
310 IF B=A AND C>A OR C=A AND B>A THEN PRINT "WIN 1/4": P(Q)=P(Q
)+INT(X/4): P=P-INT(X/4)
320 IF B=A AND C=A THEN PRINT "DOUBLE POINT. TAKE POT": P(Q)=P(Q
)+P: P=0
330 IF P(1)<1 THEN PRINT: PRINT "I WIN": END
340 IF P(2)<1 THEN PRINT: PRINT "YOU WIN": END
350 INPUT "TAP ENTER TO CONTINUE";X
360 CLS
370 NEXT Q
380 GOTO 140
390 IF P(1)<P(2) THEN S=INT(P(1)/10)
400 IF P(2)=<P(1) THEN S=INT(P(2)/10)
410 PRINT "ANTE: 1/10 OF LOW STAKE:";S
420 PRINT
430 P=P+S*2
440 P(1)=P(1)-S
450 P(2)=P(2)-S
460 RETURN
470 PRINT "I'LL BET";
480 FOR T=1 TO 500
490 NEXT T
500 IF A>3 THEN X=1
510 IF A=1 THEN X=P: IF X>P(2) THEN X=P(2)
520 IF A=2 THEN X=INT(P/3): IF X>P(2) THEN X=INT(P(2)/3)
530 IF A=3 THEN X=INT(P/10): IF X>P(2) THEN X=INT(P(2)/10)
540 IF X<1 THEN X=1
550 PRINT X
560 FOR T=1 TO 500
570 NEXT T
580 RETURN
590 END
```

the pot empties when you have 100 points and the computer 80, you each have to ante eight points to the pot because that's a tenth of the lowest stake—the computer's 80.

Here's what happens during a turn. First, one die is thrown. Its total becomes the point. Next, you can bet up to the total of your stake or the total of the pot that the next throw of two dice will be a winner. You must bet at least one point, even in very bad situations.

Here are the winners and losers of that second roll:

- You win your bet if both dice are higher than the point number.
- You win a fourth of your bet if one die is equal to the point and the other is higher.
- You win the entire pot if both dice equal the point. Example: The point is three and you throw two threes. This is called a "double point" in the game.
- You lose your bet if both dice are lower than the point or if one is equal and the other lower.

Drop Dead

```
100 REM * DROP DEAD / TRS-80 COLOR BASIC AND LEVEL II *
110 CLS
120 P(1)=0
130 P(2)=0
140 C(1)=5
150 C(2)=5
160 CLS
170 FOR Q=1 TO 2
180 IF P(1)>P(2) AND C(2)=0 OR P(2)>P(1) AND C(1)=0 GOTO 520
190 IF C(Q)=0 GOTO 490
200 IF Q=1 THEN PRINT "YOUR TURN" ELSE PRINT "MY TURN"
210 PRINT "THROWING";C(Q);
220 IF C(Q)>1 THEN PRINT "DICE" ELSE PRINT "DIE"
230 PRINT "TAP ENTER TO ROLL."
240 A$=INKEY$
250 IF A$<>"" GOTO 260 ELSE GOTO 240
260 PRINT STRING$(4*C(Q)+2,"*")
270 PRINT"*";
280 FOR A=1 TO C(Q)
290 B(A)=RND(6)
300 PRINT B(A);" ";
310 NEXT A
320 PRINT "*"
330 PRINT STRING$(4*C(Q)+2,"*")
340 C=0
350 FOR A=1 TO C(Q)
360 IF B(A)=2 THEN C=C+1
370 IF B(A)=5 THEN C=C+1
380 NEXT A
390 PRINT
400 IF C=0 GOSUB 610
410 IF C>0 GOSUB 690
420 IF C(1)=0 AND C(2)=0 GOTO 510
430 PRINT
440 PRINT "SCORE: YOU-";P(1);" ME-";P(2)
450 PRINT "DICE: YOU-";C(1);" ME-";C(2)
460 PRINT
470 INPUT "TAP ENTER TO GO ON";J
480 CLS
490 NEXT Q
500 GOTO 170
510 PRINT "ALL OUT OF DICE"
520 PRINT
530 IF P(1)>P(2) THEN T=T+1
```

Listing continues

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SPECIAL

1. DBASIC, RS Disk Basic under FLEX with a utility to copy RS to FLEX disk $30.
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Listing continued

```
540 IF P(2)>P(1) THEN W=W+1
550 IF P(1)=P(2) THEN PRINT "TIE GAME. NO SCORE."
560 PRINT
570 PRINT "SERIES: YOU";T;" ME";W
580 PRINT
590 INPUT "TAP ENTER TO CONTINUE";J
600 GOTO 110
610 FOR A=1 TO C(Q)
620 G(Q)=G(Q)+B(A)
630 NEXT A
640 PRINT "TURN:";G(Q)
650 P(Q)=P(Q)+G(Q)
660 IF G(Q)>20 THEN FOR H=1 TO 8: PRINT "WOW ";: NEXT H: PRINT:
PRINT
670 G(Q)=0
680 RETURN
690 PRINT "NO SCORE. LOSE";C;
700 IF C>1 THEN PRINT "DICE" ELSE PRINT "DIE"
710 C(Q)=C(Q)-C
720 RETURN
730 END
```

Martinetti—Level II

```
100 REM * MARTINETTI / LEVEL II *
110 CLS: CLEAR 200: B$=STRING$(62,128)
120 PRINT "MARTINETTI";
130 C(2)=8: P(1)=1: S(1)=1: S(8)=1: Y=6
140 PRINT @ 194, "1  2  3  4  5  6  7  8  9  10";
150 FOR X=2 TO 62: SET(X,Y): SET(X,Y+6): NEXT X
160 FOR X=2 TO 62 STEP 6: FOR Y=6 TO 11: SET(X,Y): NEXT Y: NEXT
X
170 X(8)=0: Y(8)=4: X(1)=0: Y(1)=14: SET(X(1),Y(1))
180 SET(X(8),Y(8))
190 FOR Q=1 TO 8 STEP 7
200 PRINT @ 384,"";
210 IF Q=1 THEN PRINT "YOUR TURN. "; ELSE PRINT "MY TURN. ";
220 INPUT "TAP ENTER TO ROLL";E
230 G=RND(6): H=RND(7): J=RND(6)
240 PRINT G;H;J: IF Q=8 GOTO 360
250 FOR Z=1 TO 7
260 IF G=S(Q) THEN R(Z)=G
270 IF H=S(Q) THEN R(Z)=H
280 IF J=S(Q) THEN R(Z)=J
290 IF G+H=S(Q) THEN R(Z)=G+H
300 IF G+J=S(Q) THEN R(Z)=G+J
310 IF H+J=S(Q) THEN R(Z)=H+J
320 IF G+H+J=S(Q) THEN R(Z)=G+H+J
330 NEXT Z
340 GOTO 710
360 FOR Z=1 TO 10
370 IF G=S(Q) THEN PRINT G;"=";S(Q): GOSUB 470
380 IF H=S(Q) THEN PRINT H;"=";S(Q): GOSUB 470
390 IF J=S(Q) THEN PRINT J;"=";S(Q): GOSUB 470
400 IF G+H=S(Q) THEN PRINT G;"+";H;"=";S(Q): GOSUB 470
410 IF G+J=S(Q) THEN PRINT G;"+";J;"=";S(Q): GOSUB 470
420 IF H+J=S(Q) THEN PRINT H;"+";J;"=";S(Q): GOSUB 470
430 IF G+H+J=S(Q) THEN PRINT G;"+";H;"+";J;"="S(Q): GOSUB 470
450 NEXT Z: GOSUB 630
460 NEXT Q: GOTO 190
470 FOR T=1 TO 500: NEXT T
480 IF W(Q)<>2 THEN S(Q)=S(Q)+1 ELSE S(Q)=S(Q)-1
490 RESET(X(Q),Y(Q))
500 IF W(Q)<>2 THEN FOR L=X(Q) TO X(Q)+5
510 IF W(Q)=2 THEN FOR L=X(Q) TO X(Q)-5 STEP -1
520 SET(L,Y(Q))
530 FOR T=1 TO 20: NEXT T
540 RESET(L,Y(Q))
550 NEXT L
560 SET(L,Y(Q)): X(Q)=L
590 IF S(Q)=0 AND W(Q)=2 GOSUB 670
600 IF S(Q)=11 GOSUB 650: S(Q)=9
610 IF Q=1 GOTO 250
620 RETURN
630 FOR V=384 TO 960 STEP 64: PRINT @ V,B$;: NEXT V
640 RETURN
650 W(Q)=2
660 RETURN
```

Listing continues

When someone goes broke, the winner is named.

This program deals only in whole numbers, no fractions; so there will be times when the ante doesn't exactly equal the total of the lowest stake. And unless you bet at least four points, the computer won't pay off in those "WIN 1/4" situations.

Confused? Then play the game and see how easy it really is.

Drop Dead

I don't like the name of this game, but it would be dishonest if I called it anything except what it's really called—Drop Dead. However, it's the dice that drop dead, not the player.

This game is all luck and no skill. There is absolutely no strategy, and to play all you have to do is tap enter over and over. Still, it can be a lot of fun to see what happens next.

Both you and the computer start out with five dice and take turns throwing. In each turn your score increases by the total of all the dice. However, if either a two or a five turns up, two things happen. First, you get no score for the turn. Second, the two and five dice are removed so you have fewer dice to throw your next turn.

Play in a round continues until one of the following happens: Both players lose all their dice; or one player loses all the dice and the other player is ahead in points. If a player who is ahead loses all the dice, the trailing player continues to throw until either losing the last die or pulling ahead.

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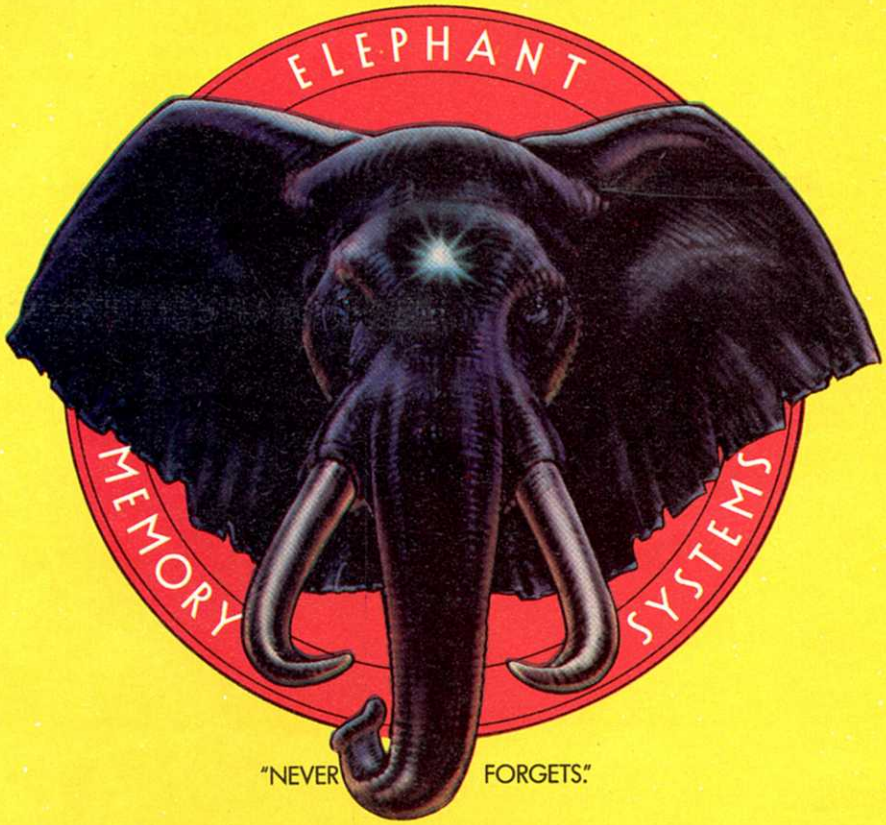

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- ☐ 7. $2,001-$2,500
- ☐ 8. Over $2,500

D. If you plan to buy a plotter during the next year, how much do you expect to spend?
- ☐ 1. Under $250
- ☐ 2. $251-$500
- ☐ 3. $501-$750
- ☐ 4. $751-$1,000
- ☐ 5. $1,001-$1,500
- ☐ 6. $1,501-$2,000
- ☐ 7. $2,001-$2,500
- ☐ 8. Over $2,500

E. If you plan to buy a new modem during the next year, how much do you expect to spend?
- ☐ 1. Under $250
- ☐ 2. $251-$500
- ☐ 3. $501-$750
- ☐ 4. $751-$1,000
- ☐ 5. $1,001-$1,500
- ☐ 6. $1,501-$2,000
- ☐ 7. $2,001-$2,500
- ☐ 8. Over $2,500

F. If you were planning to purchase an additional microcomputer, would you buy another TRS-80?
- ☐ 1. Yes
- ☐ 2. No

G. What is your major application for your TRS-80?
- ☐ 1. Word processing
- ☐ 2. Business
- ☐ 3. Freelance clerical
- ☐ 4. Education
- ☐ 5. Games
- ☐ 6. Hobby
- ☐ 7. Other home use
- ☐ 8. Other _____

H. If you use a Model II, what types of software would you like to see more of?
- ☐ 1. Word processing
- ☐ 2. Business
- ☐ 3. Freelance clerical
- ☐ 4. Education
- ☐ 5. Games
- ☐ 6. Hobby
- ☐ 7. Other home use
- ☐ 8. Other _____

I. Do you use your micro at home as a source of revenue?
- ☐ 1. Yes
- ☐ 2. No

J. Where do your children use a microcomputer?
- ☐ 1. At home
- ☐ 2. At school
- ☐ 3. Both of the above
- ☐ 4. Other _____
- ☐ 5. Don't use a micro

L. On a scale of 1 (no interest) to 5 (great interest), please rate your interest in the following regular columns:
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2	7	12	17	22	152	157	162	167	172	302	307	312	317	322	452	457	462	467	472
3	8	13	18	23	153	158	163	168	173	303	308	313	318	323	453	458	463	468	473
4	9	14	19	24	154	159	164	169	174	304	309	314	319	324	454	459	464	469	474
5	10	15	20	25	155	160	165	170	175	305	310	315	320	325	455	460	465	470	475
26	31	36	41	46	176	181	186	191	196	326	331	336	341	346	476	481	486	491	496
27	32	37	42	47	177	182	187	192	197	327	332	337	342	347	477	482	487	492	497
28	33	38	43	48	178	183	188	193	198	328	333	338	343	348	478	483	488	493	498
29	34	39	44	49	179	184	189	194	199	329	334	339	344	349	479	484	489	494	499
30	35	40	45	50	180	185	190	195	200	330	335	340	345	350	480	485	490	495	500
51	56	61	66	71	201	206	211	216	221	351	356	361	366	371	501	506	511	516	521
52	57	62	67	72	202	207	212	217	222	352	357	362	367	372	502	507	512	517	522
53	58	63	68	73	203	208	213	218	223	353	358	363	368	373	503	508	513	518	523
54	59	64	69	74	204	209	214	219	224	354	359	364	369	374	504	509	514	519	524
55	60	65	70	75	205	210	215	220	225	355	360	365	370	375	505	510	515	520	525
76	81	86	91	96	226	231	236	241	246	376	381	386	391	396	526	531	536	541	546
77	82	87	92	97	227	232	237	242	247	377	382	387	392	397	527	532	537	542	547
78	83	88	93	98	228	233	238	243	248	378	383	388	393	398	528	533	538	543	548
79	84	89	94	99	229	234	239	244	249	379	384	389	394	399	529	534	539	544	549
80	85	90	95	100	230	235	240	245	250	380	385	390	395	400	530	535	540	545	550
101	106	111	116	121	251	256	261	266	271	401	406	411	416	421	551	556	561	566	571
102	107	112	117	122	252	257	262	267	272	402	407	412	417	422	552	557	562	567	572
103	108	113	118	123	253	258	263	268	273	403	408	413	418	423	553	558	563	568	573
104	109	114	119	124	254	259	264	269	274	404	409	414	419	424	554	559	564	569	574
105	110	115	120	125	255	260	265	270	275	405	410	415	420	425	555	560	565	570	575
126	131	136	141	146	276	281	286	291	296	426	431	436	441	446	576	581	586	591	596
127	132	137	142	147	277	282	287	292	297	427	432	437	442	447	577	582	587	592	597
128	133	138	143	148	278	283	288	293	298	428	433	438	443	448	578	583	588	593	598
129	134	139	144	149	279	284	289	294	299	429	434	439	444	449	579	584	589	594	599
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536	Adcock & Johnson	423
580	Addison-Wesley Publishing	426
19	Adventure International	377
82	Aerocomp Inc.	164, 165
183	Alamo Computer Co.	301
*	Aldevco	302
136	Algorix	191
473	Alpha Byte Computer Products	13
17	Alpha Products Co.	15, 17, 19
374	ALPS	126
69	Alternate Source, The	333
217	American Small Business Computers	303
218	American Small Business Computers	305
219	American Small Business Computers	307
220	American Small Business Computers	309
221	American Small Business Computers	311
284	Ancie Labs	264
141	Anitek	361
*	Ann Arbor Precision	275
40	Apparat Inc.	143, 315
552	Applied Creative Technology Inc.	430
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383	Astro-Star Enterprises	216
152	BCCOMPCO	55
300	B.T. Enterprises	265
287	Barstrann Corporation	336
558	Barstrann Corporation	432
184	Baudy House Computer Products	336
243	Bay Technical Associates Inc.	120, 267
*	Bible Research Systems	61
106	Binary Devices	290
198	Blackjack Clinic	216
*	Bottom Line, The	67
571	Bretford Manufacturing	423
20	Business Division, The	44, 45
325	C-Cal	415
138	C&S Electronics Ltd.	179
548	C Tensl	68
181	CMD Micro	234
368	CNGA	100
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415	Comp-U-Gamer	419
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455	Compukit	424, 425
120	Computer Applications Unlimited	247
139	Computer Case Company	88
133	Computer Discount of America	376
574	Computer Friends	430
420	Computer Peripheral Resources	175
18	Computer Plus	21
24	Computer Shack	122
109	Computer Shack	123
39	Computer Shopper	197
404	Computer Solutions	140
138	Computer Station, The	179
501	Computer Systems & Services Inc.	308
*	Computerware	277
27	Computex	378, 379
511	Compuware Corp.	179
263	Compuware Corp.	179
104	ComSoft	284
405	Consolink Corp.	41
412	Continental Software	219
395	Control Corp.	128
110	Control Craft Inc.	415
105	Coosol Inc.	393
52	Cornsoft Group, The	43
45	Cornucopia Software	109
*	Cosmopolitan Electronics Corp.	351
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555	Datasoft	420
99	Data Systems	361
237	Data Terminals & Communications	355
291	Dilithium Press	231
*	Disk Supply Co.	145
204	DISKcount Data	359
441	Diskette Connection	409
5	Diskette Junction	91
37	Diskovery Unlimited	411
62	Displayed Video	182, 183, 185
167	Downeast Digital	308
353	Dresselhaus Computer Products	363
*	80 Micro	35, 131, 213, 322, 323, 361, 369, 397, 417
*	80 Micro Bookshelf	339-341
*	80 Micro Subscription	213
216	EAP Company	16
401	E & G Umlor Enterprises	133
385	E&H Software	102
382	E.J.B. Electronic Systems	415
28	EPYX/Automated Simulations	274
581	EPYX/Automated Simulations	422
49	ESI Lynx	241
147	EZ Tax	57
402	Early Games	319
545	Ebert Personal Computers	376
349	Educational Microcomputer Systems	130
154	Eigen Systems	241
159	Electronic Specialists	181
283	Endicott Software	92, 304
578	Endicott Software	430
97	Epson America Inc.	82, 83
93	Exatron	27
*	Excellonix	275
292	Floppy Disk Services Inc.	381
214	Fort Worth Computers	318
262	Frank Hogg Laboratory Inc.	383
391	Funsoft Inc.	217
66	Futuresoft	53
492	GSB Electronics Inc.	337
379	Gamester Software	107
186	Good-Lyddon Data Systems	222, 409
236	Gooth Software	413
299	GTek Corp.	363
9	H & E Computronics Inc.	73-79
409	H.F. Signalling Inc.	92
487	HPB Vector Co.	286
359	Harley D. Wilbur	302
46	Hexagon Systems	63
355	Holman D.P. Services	90
153	Holmes Engineering Inc.	29, 261
573	Homebase Computer Systems	428
373	Horizons Software	431
175	Howe Software	326
185	Hurricane Laboratories Inc.	407
211	ICR Futuresoft	69
*	IJG	141, 223, 327, 422, 427
*	inCider Apple Users	259
*	Instant Software Inc.	395
351	Institute for Scientific Analysis	213
101	J&M Systems	325
439	JES Graphics	312
273	JF Consulting	49
42	JPC Products Co.	113
534	Jameco Electronics	389
254	Jimscot Inc.	403
293	Jordon Computers Ltd.	33
331	KSoft	349
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358	KWIK Software	415
30	LNW Research Corp.	CIV
31	LNW Research Corp.	7
32	LNW Research Corp.	353
33	LNW Research Corp.	230
340	Langin-Hooper Associates	320
462	Langley-St. Clair Instrumentation Systems	31
472	Leading Edge Products Inc.	386
155	LEDS Publishing Company Inc.	327
358	Lemons Tech Services	415
554	Lemons Tech Services	432
*	Level IV Products Inc.	331
400	Lewsoft	238
131	Libra Laboratories Inc.	99
135	Lindbergh Systems	60
*	Load-80	227, 361, 401, 417
393	M.C.S. Software	32
304	MECA	275
398	M.E.S.C.	61
231	M.M. Computer Club	304
90	MWB Industries Inc.	180
457	Management Systems Software	302
553	Management, The	434
92	Maple Leaf Systems	150
579	Maple Leaf Systems	426
388	Mar-Tec	337
241	Mark Data Products	168
146	Master Electronics Inc.	431
83	Med Systems Software	51, 271
250	Melbourne House Software Inc.	65
461	Memory Merchant	195
188	Mercer Systems Inc.	167
13	Meta Technologies Corp.	9, 11
149	Micro Architect Inc.	366
247	Microcomputer Technology Inc.	146, 147
*	Microcomputing Sales Opportunity	397
459	Micro Data Supplies	59
76	Micro-Design Inc.	148
77	Micro-Design Inc.	324
463	Micro-Design Inc.	171
565	Micro-Design Inc.	428
132	Micro-80 Inc.	428
161	Micro-Grip Ltd.	241
419	Microhatch	267
569	Microhatch	422
157	Micro-Images Inc.	129
464	Micro-Labs, Inc.	388
60	Micro Mainframe	317
551	Micro Mainframe	434
96	Micro Management Systems	169
342	Micromatic Programming Co.	292
162	Micro Mega	419
117	Micromint Inc.	372
546	Micro Projects Engineering	289
575	Microserve	423
312	Microsette	94
209	Micro Software	267
526	Micro Software Systems	293
*	Micro Solutions Inc.	222
384	Micro Systems Software Inc.	CII, 207
339	Micro-Tax	68
380	Micro Tech Exports Inc.	151
125	Micro Works, The	278
*	Midwest Computer Wholesale	357
137	Miller Microcomputer Services	136
281	Mind Spa, The	130
430	Mini Systems Support	26
123	Misosys	204, 205
567	Modtec Software Division	429
562	Multi-Tech Systems Inc.	430
67	Mumford Micro Systems	229, 277
539	N.C. Software Inc.	267
533	NEBS Computer Forms	294
*	NRI Schools	189
128	Nelson Software Systems Inc.	177, 285
150	Nevins Associates	173, 175
255	New Classics Software	138
232	Nocona Electronics	151, 258, 418
54	Nodvill Software	306
*	OCR Associates	267
50	Omikron	23
195	Omnitek Computers International Inc.	206
206	Options-80	128
151	Orion Instruments	126
321	PAB Software Inc.	127
433	PCD Systems	220
25	PC Newsletter	235
242	PMC Software	95
207	Pacific Exchanges	151, 213, 390
122	Pan American Electronics	431
366	Parhelion Company	158
324	Pel-tek	81
*	Percom Data Company	3
272	Peripherals Unlimited	273
124	Perry Oil & Gas Inc.	245
*	Phase I Systems Inc.	111
490	Pion Inc.	202
160	Pioneer Software	434
73	Pius Computer Technology	329
306	Powersoft	181
315	Powersoft	263
11	Practical Peripherals	CIII
63	Precision Prototypes	47
277	Prentice Hall Inc.	253
477	Priority One Electronics	343
288	Process Control Technology	419
521	Professional Aids	393
80	Program Store, The	268, 269
143	Progressive Electronics	105
91	Prosoft	25
95	Prosoft	421
48	Quality Computer Services	236
194	Quant Systems	90
116	Quatrk Computer Systems Inc.	267
41	Racet Computes Ltd.	335
468	Racet Computes Ltd.	335
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269	Radix Technology	133
264	Rainbow P & P Corp.	54
460	Rainbow Software Services	413
296	Rainbow, The	357
130	Rand's	226
275	Red Baron Computer Products	249
114	Refware	288
145	REMarkable Software	403
129	REMsoft Inc.	239
480	Rimes Computer Products	112
512	Rockware Data Corp.	295
343	Rogo Computer Products	150
213	68 Micro Journal	213
35	SID	275
266	STSC Inc.	345
142	Sales Data Inc.	363
*	Sandpiper Software	202
203	Scientific Engineering Lab	133
510	Scott Tasso	390
528	Serious Personal Computing	42
363	Shawmut Systems	349
248	Shirley Software	312
12	Simutek	121
163	Simutek	287, 289, 291
164	Simutek	162
370	Skyline Software	289
182	Small Systems Center	327
556	Small Systems Center	430
557	Small Systems Center	426
*	Snappware	242, 243
379	Softcore Software	107
399	Soft Images/Decision Systems Inc.	257
84	Soft Sector Marketing	153
85	Soft Sector Marketing	155
86	Soft Sector Marketing	157
89	Soft Sector Marketing	159
57	Softshell	432
386	Softouch	103
537	Software Options	181
327	Software Support	36
276	Solutions Inc.	331
171	South Shore Computers	385
295	Specialized Software Inc.	127
119	Spectral Associates	201, 203
577	Spectrum Projects	429
572	Speech Systems	429
208	Spiral Enterprises	255
432	Star-Kits	125
*	StarLogic Inc.	151, 251
506	Star Micronics Inc.	101
583	Star Value Software	420
71	Sublogic Communication Corp.	297
144	Sugar Software	240
285	Sun Research Inc.	300
456	Sunlock Systems	91
210	Superior Software	54
94	Swallow Software	174
230	Synergetic Solutions	393
174	Syracuse R & D Center	16
568	3G Company	432
408	T & D Software	91
389	T.C.E. Programs	222
189	Tab Sales	172
70	Taranto & Associates Inc.	299
576	Teaching Tools Microcomputer Services	426
541	Teach Yourself By Computer Software	312
440	Tech Data Corp.	92, 115
504	Telexpress Inc.	115
59	Texas Computer Systems	279
371	Think Software	371, 409
81	Total Access	119
280	Trade Service Publications Inc.	331
44	Transaction Storage Systems Inc.	367
489	Triple-D Software	413
582	Triple-D-Software	430
397	Two/Sixteen Magazine	102, 308
522	Two/Sixteen Magazine	175
332	United Software Associates	330
417	Universal Data Research Inc.	102
*	University Microfilms Int'l.	213
215	VLM Computer Electronics	306
10	VR Data Corp.	233
352	Valley Research Company	42
169	Van Horn Office Supply	206
523	Verbatim	161
518	Vespa Computer Outlet	170
*	Videotronics of Sarasota	306
560	Votrax	420
305	Wadsworth Electronic Publications	209
*	Wayne Green Books	405
*	Wayne Green Inc.	131, 213, 322, 323, 397, 399, 433
238	Western Micro Systems	125
199	Westworld Magnetics	320
*	William Fink	93
337	Wittsoft	403
234	World Electronics	320
98	Worldwide Data Sysstems Inc.	137
158	XYZT Computer Dimensions Inc.	135
156	York 10 Computerware	365
566	Zolman International Inc.	426

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This game goes on forever. At the end of each round, a score is given on the series as a whole; then a new round begins.

Martinetti

Martinetti is the original name of this game, although I don't know why. I've altered it slightly so it fits the Color Computer screen.

To start, the computer draws the playing board, which is made up of 10 squares numbered 1 to 10. Then it places the two players' tokens at the starting position. These are at screen left. Your token is below the board, the computer's on top of the board.

When it's your turn, tapping enter rolls three dice. The values

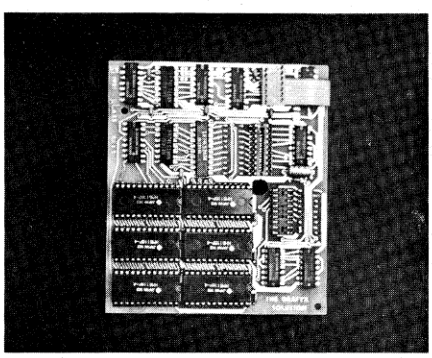
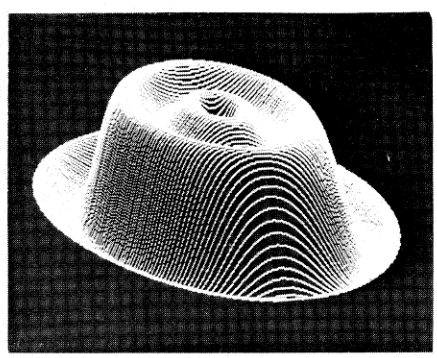
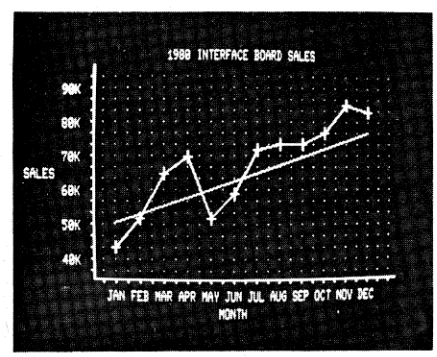
Listing continued

```
670 IF Q=1 THEN PRINT: PRINT "YOU WIN"; ELSE PRINT: PRINT "I WIN
";
680 GOTO 680
690 END
710 M=0:INPUT "NUMBER";M
720 FOR Z=1 TO 7
730 IF M=R(Z) AND M=S(Q) GOTO 480
740 IF M=0 GOSUB 630: GOTO 460
750 IF M<>R(Z) OR M<>S(1) THEN PRINT: PRINT "WRONG. I WIN";: END
760 NEXT Z
770 END
```

Martinetti—Color Basic

```
100 REM * MARTINETTI / TRS-80 COLOR BASIC 4K *
110 CLS(0): B$=STRING$(32,128)
120 PRINT"MARTINETTI ";
130 C(Q)=8: P(Q)=1: S(1)=1: S(8)=1: Y=6
140 PRINT @ 129," 1  2  3  4  5  6  7  8  9  10";
150 FOR X=2 TO 62: SET(X,Y,3): SET(X,Y+5,3): NEXT X
160 FOR X=2 TO 62 STEP 6: FOR Y=6 TO 11: SET(X,Y,3): NEXT Y: NEX
T X
170 X(8)=0: Y(8)=4: X(1)=0: Y(1)=13: SET(X(1),Y(1),1)
180 SET(X(8),Y(8),8)
190 FOR Q=1 TO 8 STEP 7: PRINT @ 256,"";
200 PRINT @ 256,"";
210 IF Q=1 THEN PRINT "YOUR TURN. "; ELSE PRINT "MY TURN. ";
220 INPUT "TAP ENTER TO ROLL";E
230 G=RND(6): H=RND(6): J=RND(6)
240 PRINT G;H;J: IF Q=8 GOTO 350
250 FOR Z=1 TO 7
```

Listing continues

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SN7413N	14	.35
SN7414N	14	.49
SN7416N	14	.25
SN7417N	14	.25
SN7420N	14	.19
SN7421N	14	.35
SN7422N	14	.45
SN7423N	16	.59
SN7425N	14	.29
SN7426N	14	.29
SN7427N	14	.25
SN7428N	14	.49
SN7430N	14	.25
SN7432N	14	.29
SN7437N	14	.25
SN7438N	14	.29
SN7439N	14	.59
SN7440N	14	.19
SN7441N	16	.89
SN7442N	16	.45
SN7443N	16	.99
SN7444N	16	.99
SN7445N	16	.69
SN7446N	16	.69
SN7447N	16	.69
SN7448N	16	.69
SN7450N	14	.19
SN7451N	14	.19
SN7453N	14	.19
SN7454N	14	.19
SN7459A	14	.25
SN7460N	14	.19
SN7470N	14	.29

Part No.	**Pins	Price
SN7472N	14	.29
SN7473N	14	.35
SN7474N	14	.35
SN7475N	16	.45
SN7476N	16	.35
SN7479N	14	4.95
SN7480N	14	.69
SN7482N	14	1.19
SN7483N	16	.59
SN7485N	16	.59
SN7486N	14	.35
SN7489N	16	2.25
SN7490N	14	.39
SN7491N	14	.59
SN7492N	14	.39
SN7493N	14	.39
SN7494N	14	.69
SN7495N	14	.49
SN7496N	16	.49
SN7497N	16	2.75
SN74100N	24	1.49
SN74104N	14	.89
SN74105N	14	.89
SN74107N	**14**	**.29**
SN74109N	**16**	**.39**
SN74116N	24	1.49
SN74121N	14	.39
SN74122N	14	.55
SN74123N	16	.49
SN74125N	14	.45
SN74126N	14	.45
SN74132N	14	.49
SN74136N	14	.69
SN74141N	16	.69
SN74142N	16	2.95
SN74143N	24	2.95
SN74144N	24	2.95
SN74145N	16	.59
SN74147N	16	1.49
SN74148N	16	1.19
SN74150N	24	1.19
SN74151N	16	.59
SN74152N	14	.59
SN74153N	16	.59
SN74154N	24	1.25
SN74155N	16	.59

Part No.	**Pins	Price
SN74156N	16	.59
SN74157N	**16**	**.59**
SN74160N	16	.69
SN74161N	16	.69
SN74162N	16	.69
SN74163N	16	.69
SN74164N	14	.69
SN74165N	16	.69
SN74166N	16	.89
SN74167N	16	2.79
SN74170N	16	1.29
SN74172N	24	4.95
SN74173N	16	.69
SN74174N	16	.69
SN74175N	16	.69
SN74176N	14	.69
SN74177N	14	.69
SN74179N	16	1.49
SN74180N	14	.69
SN74181N	24	1.95
SN74182N	16	.89
SN74184N	16	1.95
SN74185N	16	1.95
SN74190N	16	.69
SN74191N	16	.69
SN74192N	16	.69
SN74193N	16	.69
SN74194N	16	.69
SN74195N	16	.69
SN74196N	14	.89
SN74197N	14	.89
SN74198N	24	1.19
SN74199N	24	1.19
SN74221N	16	1.19
SN74251N	16	.79
SN74276N	20	1.95
SN74279N	16	.79
SN74283N	16	1.49
SN74284N	16	2.95
SN74285N	16	2.95
SN74365N	16	.55
SN74366N	16	.55
SN74367N	16	.55
SN74368N	16	.55
SN74390N	16	1.49
SN74393N	14	1.49

74LS

74LS00	14	.25
74LS01	14	.25
74LS02	14	.25
74LS03	14	.25
74LS04	14	.29
74LS05	14	.29
74LS08	14	.29
74LS09	14	.29
74LS10	14	.29
74LS11	14	.35
74LS12	14	.35
74LS13	14	.39
74LS14	14	.59
74LS15	14	.35
74LS20	14	.29
74LS21	14	.29
74LS22	**14**	**.29**
74LS26	14	.29
74LS27	14	.29
74LS28	14	.35
74LS30	14	.29
74LS32	14	.35
74LS33	14	.55
74LS37	14	.35
74LS38	14	.35
74LS40	14	.29
74LS42	16	.55
74LS47	16	.75
74LS48	16	.75
74LS49	14	.75
74LS51	14	.25
74LS54	14	.25
74LS55	14	.29
74LS73	14	.39
74LS74	14	.39
74LS75	16	.39
74LS76	16	.39
74LS78	14	.39
74LS83	16	.65
74LS85	16	.69
74LS86	14	.39
74LS90	14	.55

74LS92	14	.79
74LS93	16	.79
74LS94	16	.69
74LS95	16	.69
74LS97	14	.79
74LS221	16	.89
74LS240	20	1.09
74LS241	20	1.09
74LS242	14	1.09
74LS243	14	1.09
74LS244	20	1.09
74LS245	20	1.49
74LS247	16	1.09
74LS248	16	1.09
74LS249	16	1.09
74LS251	16	.59
74LS253	16	.59
74LS257	16	.59
74LS258	16	.59
74LS260	14	.59
74LS266	14	.69
74LS273	20	1.49
74LS279	16	.49
74LS283	16	.69
74LS290	14	.89
74LS293	14	.79
74LS298	16	.89
74LS352	16	1.29
74LS353	16	1.29
74LS365	16	.49
74LS366	16	.49
74LS367	16	.49
74LS368	16	.49
74LS373	20	1.29
74LS374	20	1.29
74LS375	16	.69
74LS386	14	.45
74LS393	14	1.19
74LS399	16	1.49
74LS670	16	1.49
81LS95	20	1.49
81LS97	20	1.49

74S/PROMS*

74S00	14	.35
74S02	14	.35
74S03	14	.35
74S04	14	.45
74S05	14	.45
74S08	14	.39
74S09	14	.39
74S10	14	.35
74S11	14	.35
74S15	14	.35
74S20	14	.35
74S22	14	.35
74S30	14	.35
74S32	14	.45
74S38	14	.89
74S40	14	.39
74S51	14	.35
74S64	14	.39
74S65	14	.39
74S74	14	.55
74S86	14	.55
74S112	16	.55
74S113	14	.55
74S114	14	.55

74S124	16	2.95
74S133	16	.45
74S134	16	.50
74S135	16	.69
74S136	14	1.39
74S138	16	.89
74S139	16	.89
74S140	14	.55
74S151	16	.99
74S153	16	.99
74S157	16	.99
74S158	16	.99
74S160	16	2.49
74S174	16	.99
74S175	16	.99
74S188*	16	1.49
74S194	16	1.49
74S195	16	1.49
74S196	14	1.49
74S240	20	2.25
74S241	20	2.25
74S242	14	2.49

74S243	14	2.49
74S244	20	2.49
74S251	16	1.19
74S253	16	1.19
74S257	16	1.19
74S258	16	1.19
74S260	14	.79
74S280	14	1.95
74S287*	16	1.95
74S288*	16	1.95
74S373	20	2.49
74S374	20	2.49
74S387*	16	1.95
74S471*	20	5.95
74S472*	20	4.95
74S473*	20	4.95
74S474*	24	4.95
74S475*	24	4.95
74S570*	16	2.95
74S571*	16	2.95
74S572*	18	4.95
74S573*	18	4.95
74S940	20	2.49
74S941	20	2.49

CA—LINEAR

CA3010H		.99
CA3013H		2.15
CA3023H		3.25
CA3035H		5.95
CA3039H		1.35
CA3046N	14	.89
CA3059N	14	3.25

CA3060N	16	3.25
CA3080E	8	.89
CA3081N	16	1.49
CA3082N	16	1.49
CA3083N	16	1.49
CA3086N	14	.69

CA3089N	16	1.69
CA3096N	16	1.19
CA3130E	8	1.49
CA3140E	8	.99
CA3160H		1.95
CA3401N	14	.59
CA3600N	14	3.95

CD—CMOS

CD4000	14	.29
CD4001	**14**	**.29**
CD4002	14	.29
CD4006	14	.89
CD4007	14	.29
CD4009	**16**	**.39**
CD4010	16	.39
CD4011	14	.29
CD4012	**14**	**.15**
CD4013	14	.39
CD4014	16	.79
CD4015	**16**	**.39**
CD4016	14	.39
CD4017	16	.75
CD4018	16	.79
CD4019	16	.39
CD4020	16	.75
CD4021	16	.79
CD4022	16	.79
CD4023	14	.29
CD4024	14	.69
CD4025	14	.23
CD4026	16	2.49
CD4027	16	.45
CD4028	16	.69
CD4029	16	.79
CD4030	14	.39
CD4034	24	1.95
CD4035	16	.89
(More in Catalog)		

CD4040	16	.79
CD4041	14	.79
CD4042	16	.69
CD4043	16	.79
CD4044	16	.79
CD4046	16	.89
CD4047	14	.89
CD4048	16	.39
CD4049	**16**	**.39**
CD4050	16	.39
CD4051	16	.79
CD4052	16	.79
CD4053	16	.79
CD4056	16	2.95
CD4059	24	7.95
CD4060	16	.89
CD4066	14	.39
CD4068	14	.39
CD4069	14	.29
CD4070	14	.39
CD4071	14	.29
CD4072	14	.29
CD4073	14	.29
CD4075	14	.29
CD4076	16	.79
CD4078	14	.49
CD4081	**14**	**.29**
CD4082	14	.29
CD4093	14	.49

CD4098	16	1.95
CD4506	16	1.19
CD4507	14	.39
CD4508	24	3.95
CD4510	16	.89
CD4511	16	.89
CD4512	16	.89
CD4514	24	1.79
CD4515	24	1.79
CD4516	16	.99
CD4518	16	.99
CD4519	16	.39
CD4520	16	.79
CD4526	16	1.19
CD4528	16	1.19
CD4529	16	1.19
CD4543	16	1.19
CD4562	14	6.95
CD4566	16	1.39
CD4583	16	2.49
CD4584	14	.59
CD4723	16	1.19
CD4724	16	1.19
MC14409	16	13.95
MC14410	16	13.95
MC14411	24	11.95
MC14412	16	13.95
MC14419	16	7.95
MC14433	24	13.95
MC14538	16	1.19
MC14541	14	1.19

MICROPROCESSOR COMPONENTS

MICROPROCESSOR CHIPS

Part No.	**Pins	Function	Price
CDP1802	40	CPU	$9.95
2650	40	CPU	14.95
IDM2901ADC	40	CPU—4-bit slice (Com. Temp. Gr.)	19.95
MCS6502	40	MPU w/Clock (65K bytes mem.)	9.95
MC6802CP	40	MPU w/Clock and RAM	7.95
INS8035N-6	40	MPU—8-bit (6MHz)	5.95
INS8039N-6	40	CPU-Sgl. chip 8-bit (128 bts. Ram)	5.95
INS8040N-6	40	CPU (256 bytes RAM)	5.95
INS8070N	40	CPU (64 bytes RAM)	11.95
INS8073N	40	CPU w/Basic Micro Interpreter	14.95
P8085A	40	CPU	5.95

Z80, Z80A, Z80B, Z8000 SERIES

Part No.	**Pins	Function	Price
Z80	40	CPU (MK3880N)(780C) 2MHz	$4.95
Z80-CTC	28	Counter Timer Circuit	5.95
Z80-DART	40	Dual Asynchronous Rec./Trans.	11.95
Z80-DMA	40	Direct Memory Access Circuit	15.95
Z80-P10	40	Parallel I/O Interface Controller	5.95
Z80-S10/0	40	Serial I/O (TxCB and RxCB Bonded)	15.95
Z80-S10/1	40	Serial I/O (Lacks DTRB)	15.95
Z80-S10/2	40	Serial I/O (Lacks SYNCB)	15.95
Z80-S10/9	40	Serial I/O	15.95
Z80A	40	CPU (MK3880N-4)(780C-1) 4MHz	5.95
Z80A-CTC	28	Counter Timer Circuit	5.95
Z80A-DART	40	Dual Asynchronous Rec./Trans.	11.95
Z80A-DMA	40	Direct Memory Access Circuit	17.95
Z80A-P10	40	Parallel I/O Interface Controller	5.95
Z80A-S10/0	40	Serial I/O (TxCB and RxCB bonded)	16.95
Z80A-S10/1	40	Serial I/O (Lacks DTRB)	16.95
Z80A-S10/2	40	Serial I/O (Lacks SYNCB)	16.95
Z80A-S10/9	40	Serial I/O	16.95
Z80B	40	CPU (MK3880N-6) 6MHz	11.95
Z80B-CTC	28	Counter Timer Circuit	13.95
Z80B-P10	40	Parallel I/O Interface Controller	13.95
Z8001	48	CPU Segmented	51.95
Z8002	40	CPU Non-Segmented	55.95
Z8030	40	Serial Comm. Controller	44.95
Z8036	40	Counter/Timer & Parallel I/O Unit	29.95

6800/68000 SERIES

Part No.	**Pins	Function	Price
MC6800	40	MPU	4.95
MC6802CP	40	MPU with clock and RAM	7.95
MC6810API	24	128x8 Static RAM	3.95
MC6821	40	Peripheral Inter. Adapt (MC6820)	4.95
MC6828	24	Priority Interrupt Controller	15.95
MC6830L8	24	1024x8-bit ROM (MC68A30-8)	10.95
MC6850	24	Asynchronous Comm. Adapter	4.95
MC6852	24	Synchronous Serial Data Adapter	5.75
MC6860	24	0-600bps Digital MODEM	9.95
MC6862	24	2400bps Modulator	12.95
MC6880A	16	Quad 3-state bus. trans. (MC8T26)	2.25
MC68000L8	64	MPU 16-Bit (8MHz)	69.95
MC68488P	40	General Purpose Int. Adapter	8.95
MC68652P2	40	Multi. Protocol Comm. Controller	24.95
MC68661PB	28	Enhanced Prog. Comm. Int.	8.95

8080A SERIES

Part No.	**Pins	Function	Price
INS8080A	40	CPU	3.95
TMS5501	40	Synchronous Data Interface (SIRC)	14.95
INS8154	40	128 Byte RAM 16-Bit I/O	13.95
INS8226	20	Octal D Flip Flop Tri-State (74C374)	2.49
DP8212	24	8-bit Input/Output (74S412)	2.25
DP8214	24	Priority Interrupt Control	3.95
DP8216	16	Bi-Directional Bus Driver	2.25
DP8224	16	Clock Generator/Driver	2.25
DP8226	16	Bus Driver	2.25
DP8228	28	System Cont./Bus Driver (74S428)	3.49
DP8238	28	System Controller (74S438)	4.49
INS8243	24	I/O Expander for 48 Series	5.95
INS8245	18	16-Key Keyboard Encoder (74C922)	4.49
INS8246	20	20-Key Keyboard Encoder (74C923)	4.95
INS8247	28	Display Controller (74C911)	8.95
INS8248	28	Display Controller (74C912)	8.95
INS8250N	40	Asyn. Comm. Element (INS8250)	10.95
DP8251	28	Prog. Comm. I/O (USART)	4.49
DP8253	24	Prog. Interval Timer	6.95
DP8255	40	Prog. Peripheral I/O (PPI)	4.49
DP8257	40	Prog. DMA Control	7.95
DP8259	28	Prog. Interrupt Control	6.95
DP8275	40	Prog. CRT Controller	29.95
DP8279	40	Prog. Keyboard/Display Interface	6.95
DP8303	28	8-Bit Tri-State Bi-Directional Trans.	3.95
DP8304	20	8-bit Bi-Directional Receiver	2.49
DP8307	20	8-bit Bi-Directional Receiver	2.49
DP8308	20	8-bit Bi-Directional Receiver	2.49
DP8310	20	Octal Latched Peripheral Driver	4.95
DP8311	20	Octal Latched Peripheral Driver	4.95

MICROPROCESSOR MANUALS & DATA BOOKS

M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00
10400	1982 Intel Data Book (1405 pg.)	14.95
30001	1981 Nat. CMOS Book (628 pg.)	6.95
30002	1980 Nat. Interface Book (640 pg.)	6.95
30003	1982 Nat. Linear Book (1952 pg.)	11.95
30005	1981 Nat. TTL Book (624 pg.)	9.95
30008	1980 Nat. Memory Data Book (464 pg.)	6.95
30011	1980 Nat. Linear Applications (736 pg.)	15.95
30013	1983 Zilog Data Book (641 pg.)	7.95
205610	1981 Intel Peripheral Design (628 pg.)	9.95

DYNAMIC RAMS

Part No.	**Pins		Price
1103	18	1024x1 (300ns)	.99
4027	**16**	**4096x1 (250ns)**	**2.49**
4116N-2	16	16,384x1 (150ns)	1.89 - 8/14.95
4116N-3	16	16,384x1 (200ns)	1.69 - 8/12.95
4116N-4	16	16,384x1 (250ns)	1.49 - 8/10.95
4164N-150	16	65,536x1 (150ns)	7.95 - 8/59.95
4164N-200	16	65,536x1 (200ns)	7.49 - 8/54.95
MM5261	18	1024x1 (300ns)	.49 - 8/1.95
MM5262	**22**	**2048x1 (365ns)**	**.49 — 8/1.95**
MM5270	18	4096x1 (250ns) MK4096	4.95
MM5280	22	4096x1 (200ns) 2107	3.95
MM5290-2	16	16,384x1 (150ns)	1.89 - 8/14.95
MM5290-3	16	16,384x1 (200ns)	1.69 - 8/12.95
MM5290-4	16	16,384x1 (250ns)	1.49 - 8/10.95
MM5298-3	16	8192x1 (200ns)	1.69

STATIC RAMS

Part No.	**Pins		Price
1101	16	256x1 (650ns)	1.49
2101	22	256x4 (450ns) 8101	2.49
2102	16	1024x1 (350ns)	.89
21L02	16	1024x1 (450ns) L.P.	1.49
2111	18	256x4 (450ns) 8111	2.95
2112	16	256x4 (450ns) MOS	2.95
2114	18	1024x4 (450ns)	1.95 - 8/13.95
2114L	18	1024x4 (450ns) L.P.	2.25 - 8/15.95
2114-2	18	1024x4 (200ns)	2.25 - 8/15.95
2114L-2	18	1024x4 (200ns) L.P.	2.49 - 8/17.95
2141-3	18	4096x1 (150ns)	3.95
2147	18	4096x1 (70ns)	4.95
2148	18	1024x4 (70ns)	8.95
TMS4044	18	4096x1 (450ns)	3.95
TMS4045	18	1024x4 (450ns)	3.95
5101	22	256x4 (450ns) CMOS	4.95
MM5257	18	4096x1 (450ns) 4044	4.95
HM6116P-3	24	2048x8 (150ns) CMOS	7.95
HM6116-4	24	2048x8 (200ns) CMOS	6.95
HM6116LP-4	24	2048x8 (200ns) L.P. CMOS	7.95
7489	16	16x4 (50ns) 3101	2.25
74S920	22	256x4 (250ns) CMOS (6551)	3.95
74C921	18	256x4 (250ns) CMOS	3.95
74C929	16	1024x1 (250ns) CMOS (6501)	3.95
74C930	18	1024x1 (250ns) CMOS (6518)	3.95
74S189	16	16x4 (35ns) 93405	1.95
74S200	16	256x1 (80ns) 93410	3.95
74S206	16	256x1 (60ns) 93411	3.95
74S289	16	16x4 (35ns) 3101	2.25
82S10	16	1024x1 (50ns) O.C. (93415)	3.95
82S25	16	16x4 (50ns) O.C. (74S289)	2.25

EPROMS

Part No.	**Pins		Price
1702A	24	256x8 (1us)	4.95
2708	24	1024x8 (450ns)	3.95
2708-5	24	1024x8 (550ns) SM00246	2.95
TMS2516	24	2048x8 (450ns) 2716	6.95
TMS2532	24	4096x8 (450ns) NMC2532	9.95
TMS2564	28	8192x8 (450ns)	19.95
TMS2716	24	2048x8 (450ns) 3 voltage	7.95
2716	24	2048x8 (450ns)	4.95
2716-1	24	2048x8 (350ns)	6.95
2732	24	4096x8 (450ns)	9.95
2758Q	24	1024x8 (450ns) single +5V	2.95
MM2764	28	8192x8 (450ns)	16.95
MM2764-3	28	8192x8 (300ns)	19.95

PROMS

Part No.	**Pins		Price
74S188	16	32x8 PROM O.C. (6330-1)	1.49
74S287	16	256x4 PROM T.S. (6301-1)	1.95
74S288	16	32x8 PROM T.S. (6331-1)	1.95
74S387	16	256x4 PROM O.C. (6300-1)	1.95
74S471	20	256x8 PROM T.S. (6309-1)	5.95
74S472	20	512x8 PROM T.S. (6349-1)	4.95
74S473	20	512x8 PROM O.C. (6348)	4.95
74S474	24	512x8 PROM T.S. (DM87S296N)	4.95
74S475	24	512x8 PROM O.C. (6340)	4.95
74S478	24	1024x8 PROM T.S. (TBP28S86)	8.95
74S570	16	512x4 PROM O.C. (6305)	2.95
74S571	16	512x4 PROM T.S. (6306)	2.95
74S572	18	1024x4 PROM O.C. (6352)	4.95
74S573	18	1024x4 PROM T.S. (82S137)	4.95
82S23	16	32x8 PROM O.C. (27S18)	2.95
82S115	24	512x8 PROM T.S. (27S15)	9.95
82S123	16	32x8 PROM T.S. (27S19)	2.95
82S126	16	256x4 PROM O.C. (27S20)	3.95
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DE9S	9 Pin Socket	1.95
DA15P	15 Pin Plug	1.95
DA15S	15 Pin Socket	2.95
DB25P	**25 Pin Plug (Meets RS232)**	**2.49**
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DB25P-831	25 Pin Right Angle Plug	4.95
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DC37P	37 Pin Plug	4.95
DC37S	37 Pin Socket	5.95
DD50P	50 Pin Plug	5.95
DD50S	50 Pin Socket	6.95

Accessories

DE-9H	Hood for DE-9 Series Connectors	$1.19
DA-15H	Hood for DA-15 Series Connectors	1.29
DB25H	Hood for DB25 Series Connectors	1.25
DC37H	Hood for DC37 Series Connectors	1.39
DD50H	Hood for DD50 Series Connectors	1.49
D20418-2	2 screws for mtg. connectors to a panel	.79

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Part No.	Cnts.	Sp.	Description	Price
15/30SE	15/30	.156	Solder Eyelet	$1.79
18/36SE	18/36	.156	Solder Eyelet	1.95
22/44SE	22/44	.156	Solder Eyelet	2.49
22/44PC	22/44	.156	PC type (no mtg. ears)	.99
50/100SE	50/100	.125	Solder Eyelet	9.95
22/44WW	22/44	.156	Wire Wrap - Level 3	4.95
67031-5	22/44	.156	WW Plus .062x.(D3x.75)	3.95
R-681-1	50/100	.125	Wire Wrap - Level 3	7.95
R-681-2	50/100	.125	Wire Wrap - Level 1	6.95

RF Coaxial Connectors

Part No.	Description	Price
PL259	UHF Plug	$ .89
SO239	UHF Panel Receptacle	.69
PL258	UHF Straight Adapter	.89
UG175/U	UHF Reducing Adapter	.49
UG88/U	BNC Plug	1.49
UG89/U	BNC Jack	1.69
UG306/U	BNC Angle Adapter	2.49
UG260/U	BNC Plug	1.49
UG1094/U	BNC Bulkhead Receptacle	.89

IC SOCKETS

For Socket Required, See Column After The IC Part No.

LOW PROFILE (TIN) SOCKETS

	1-9	10-99	100-999
8 pin LP	.16	.14	.13
14 pin LP	.17	.15	.14
16 pin LP	.19	.17	.16
18 pin LP	.26	.24	.23
20 pin LP	.30	.27	.25
22 pin LP	.31	.28	.26
24 pin LP	.33	.30	.28
28 pin LP	.40	.37	.35
36 pin LP	.46	.42	.39
40 pin LP	.49	.45	.43

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Listing continued

```
260 IF G=S(Q) THEN R(Z)=G
270 IF H=S(Q) THEN R(Z)=H
280 IF J=S(Q) THEN R(Z)=J
290 IF G+H=S(Q) THEN R(Z)=G+H
300 IF G+J=S(Q) THEN R(Z)=G+J
310 IF H+J=S(Q) THEN R(Z)=H+J
320 IF G+H+J=S(Q) THEN R(Z)=G+H+J
330 NEXT Z
340 GOTO 700
350 PRINT @ 352,"";
360 FOR Z=1 TO 10
370 IF G=S(Q) THEN PRINT G;"=";S(Q): GOSUB 470
380 IF H=S(Q) THEN PRINT H;"=";S(Q): GOSUB 470
390 IF J=S(Q) THEN PRINT J;"=";S(Q): GOSUB 470
400 IF G+H=S(Q) THEN PRINT G;"+";H;"=";S(Q): GOSUB 470
410 IF G+J=S(Q) THEN PRINT G;"+";J;"=";S(Q): GOSUB 470
420 IF H+J=S(Q) THEN PRINT H;"+";J;"=";S(Q): GOSUB 470
430 IF G+H+J=S(Q) THEN PRINT G;"+";H;"+";J;"="S(Q): GOSUB 470
440 PRINT @ 320,B$;: PRINT @ 320,"";
450 NEXT Z: GOSUB 630
460 NEXT Q: GOTO 190
470 FOR T=1 TO 500: NEXT T
480 IF W(Q)<>2 THEN S(Q)=S(Q)+1 ELSE S(Q)=S(Q)-1
490 RESET(X(Q),Y(Q))
500 IF W(Q)<>2 THEN FOR L=X(Q) TO X(Q)+5
510 IF W(Q)=2 THEN FOR L=X(Q) TO X(Q)-5 STEP -1
520 SET(L,Y(Q),Q)
530 FOR T=1 TO 20: NEXT T
540 RESET(L,Y(Q))
550 NEXT L
560 SET(L,Y(Q),Q): X(Q)=L
570 PRINT @ 352,B$;
580 PRINT @ 320,"";
590 IF S(Q)=0 AND W(Q)=2 GOSUB 670
600 IF S(Q)=11 GOSUB 650: S(Q)=9
610 IF Q=1 GOTO 250
620 RETURN
630 FOR V=256 TO 384 STEP 32: PRINT @ V,B$;: NEXT V
640 RETURN
650 W(Q)=2
660 RETURN
670 PRINT @ 384,"";: IF Q=1 THEN PRINT "YOU WIN"; ELSE PRINT "I
WIN.";
680 GOTO 680
690 END
700 PRINT @ 352,"";
710 M=0:INPUT "NUMBER";M
720 FOR Z=1 TO 7
730 IF M=R(Z) AND M=S(Q) GOTO 480
740 IF M=0 GOSUB 630: GOTO 460
750 IF M<>R(Z) OR M<>S(1) THEN PRINT @ 384,"WRONG. I WIN.";: END
760 NEXT Z
770 END
```

FUN HOUSE

of the dice are shown.

Now, here's the tricky part. To advance, you must use one, two, or three dice that equal the number in the next square and then enter that number.

For example, if the dice show totals of one, two, and five, you enter 1 because 1 = 1, 2 because 2 = 2, and 3 because 1 + 2 = 3. You continue your advance in any turn as long as you keep coming up with totals equal to the number in the next square. To end a turn, type 0 (zero) and tap enter.

When you reach square 10, work your way back down to one. The player who returns to the beginning first is the winner.

The computer plays automatically and shows its totals.

Oh, I forgot to mention that mistakes are costly. If you enter a total that isn't equal to the next square or isn't equal to any of your dice added together, then the computer wins the game immediately. However, you aren't punished for not seeing a possible move, except for the fact that the computer plays perfectly and you must do the same to win even half the time.

Coming Attractions: Next month you and I are going to write an adventure column together. Sharpen your imagination. ■

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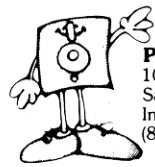

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3 3rd prizes—$50 each, Plus Publication
Honorable Mentions—Free subscription to *80 Micro* and possible publication
(These prizes are in addition to our regular purchase price.)

If you are an aspiring Programmer, 18 years or younger, enter **80 Micro**'s 2nd Annual Young Programmer's Contest. Your entry may be for any TRS-80. Programs will be judged on originality, documentation (more on this below), and program elegance. The age categories are 11 and under, 12 through 14, and 15 through 18. All entries will be judged by the **80 Micro** staff.

Rules

1. Final entries must be in by November 1, 1983.
2. All entries must be submitted in a 10 × 13″ envelope and must include: typewritten, double-spaced documentation; a printed copy of the program listing; a magnetic disk or cassette containing the program listing, the documentation, and any figures or tables; and a completed entry blank.
3. Documentation should consist of an explanation of the program, its purpose, how to use it, and the necessary software and hardware needed to use it (including memory requirements). Good documentation also points out the interesting algorithms and program techniques used without giving a line-by-line account.
4. Entries must be original and unpublished.
5. All winning programs become the property of **80 Micro**.
6. The category in which you will be judged will be determined by your age as of November 1, 1983. You must not have turned 19 by that date.
7. You may submit as many entries as you like, however, each one must be submitted separately and must have all of the information and materials stated above.

The *80 Micro* Young Programmer's Contest

Name_____ Age_____ Date of Birth_____

Street Address_____ City_____

State/Zip_____ Phone _____

Machine (circle one)

Model I Model III Model II/16 Color Computer

Pocket Computer Other_____

Include this form with your entry and return to:

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80 Pine Street
Peterborough, NH 03458

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Listing 1 continued from p. 32

```
780 IFFL/2=INT(FL/2)THENG$="*"ELSEG$=" "
800 QQ=QQ+64:PRINT@QQ,G$;:PRINT@QQ+43,G$;:IFQQ>522THENQQ=330
820 IFCK/5=INT(CK/5)THENPRINT@793,"?"CHR$(95);:GOTO720:ELSEPRINT
@793,"?"CHR$(143);:PRINT@832,S$;:PRINT@865,"All Rights Reserved.
";:GOTO720
840 ON M GOTO 860,880,900,920
860 RUN"DREADER/BAS"
880 IFPEEK(&H403E)<81THENRUN"SORT50/BAS"ELSERUN"SORT/BAS"
900 RUN"PRINT/BAS"
920 CLS:PRINT@512,STRING$(64,140)"       Thank you for purchasin
g and using MAGIDEX!":PRINTSTRING$(64,140);:CMD"S"
```

Program Listing 2

```
20 REM ******************************************************
40 REM ***          SORT/BAS a simple SHELL  routine        ***
60 REM ***             COPYRIGHT (c) 1981  by               ***
80 REM ***                Charles P. Knight                 ***
100 REM***            for use with MAGIDEX program          ***
120 REM***            USE LDOS 5.1 ONLY                     ***
140 REM******************************************************
160 IFPEEK(&H403E)=80THENRUN"SORT50/BAS"'LDOS 5.0
180 IFPEEK(&H403E)<81THENPRINT"WRONG OPERATING SYSTEM - LDOS 5.1
 ONLY!":STOP
200 ONERRORGOTO1040:CLS:CLEAR29000:DEFINTA-Z:DIME$(800)
220 ONERRORGOTO320:CLS
240 OPEN"I",1,"TRANSFER/DAT"
260 INPUT#1,V1,D2,D2$,DN,IN
280 CLOSE
300 ONERRORGOTO0:GOTO340
320 PRINT"CAN'T SORT WITHOUT FILE TRANSFER/DAT":RUN"MAGIDEX"
340 IFIN<800THEN780ELSEPRINT"There are"IN" records to sort.
360 PRINT"This is an EXTERNAL sort. It moves data around on the
disk
380 PRINT"rather than bringing it into memory. As a result, the
maximum
400 PRINT"file size is limited only by the amount of space remai
ning on
420 PRINT"your disk. The disadvantage is that it takes a good de
al
440 PRINT"longer to perform."
460 PRINT"Be sure you have BACKED UP your disk before running th
is sort.
480 PRINT
500 INPUT"Do you wish to sort this file now";E$:IFLEFT$(E$,1)="n
"ORLEFT$(E$,1)="N"THENRUN"MAGIDEX"
520 CLS:CMD"T"
540 OPEN"R",1,"DIRECTRY/DAT"+D2$,32
560 FIELD1,32 AS A1$:GET1,IN:SET EOF(1)
580 M=IN
600 M=INT(M/2):PRINT@512,"Now making sort pass # ";USING"####";M
;:IFM=0THEN740ELSEJ=1:K=IN-M
620 I=J
640 L=I+M
660 GET1,I:V1$=A1$:GET1,L:V2$=A1$:IFV2$>=V1$THEN720
680 LSETA1$=V1$:PUT1,L:LSETA1$=V2$:PUT1,I
700 I=I-M:IFI>1THEN640
720 J=J+1:IFJ>KTHEN600ELSE620
```

Listing 2 continues

Listing 2 continued

```
740 CLOSE:CMD"R"
760 RUN"MAGIDEX
780 PRINT@512,"Initializing memory for sort.";
800 CMD"T":OPEN"R",1,"DIRECTRY/DAT"+D2$,32
820 FIELD1,32ASF1$:GET1,IN:SET EOF(1)
840 FORX=1TOIN
860 GET1,X
880 E$(X)=F1$
900 NEXTX
920 CMD"O",IN,E$(1)
940 FORX=1TOIN
960 LSETF1$=E$(X)
980 PUT1,X
1000 NEXTX
1020 GOTO740
1040 IFERR/2+1=7THENPRINT"NOT ENOUGH MEMORY - REDUCE THE SIZE OF
 YOUR SYSGEN!":RUN"MAGIDEX"ELSEPRINT"ERROR : "ERR,ERL:STOP
```

Program Listing 3

```
20 REM ******************************************************
40 REM ***          SORT/BAS a simple SHELL  routine        ***
60 REM ***             COPYRIGHT (c) 1982  by               ***
80 REM ***                Charles P. Knight                 ***
100 REM***            for use with MAGIDEX program          ***
120 REM***            FOR USE WITH LDOS 5.0 ONLY            ***
140 REM******************************************************
160 CLS:CLEAR29000:DEFINTA-Z:DIME$(800)
180 POKE15360,97:IFPEEK(15360)=97THENLC=-1ELSELC=0
200 CLS
220 ONERRORGOTO320
240 OPEN"I",1,"TRANSFER/DAT"
260 INPUT#1,V1,D2,D2$,DN,IN
280 CLOSE
300 ONERRORGOTO0:GOTO340
320 PRINT"CAN'T SORT WITHOUT FILE TRANSFER/DAT":RUN"MAGIDEX
340 IFIN<800THEN820ELSEPRINT"There are"IN" records to sort.
360 PRINT"This is an EXTERNAL sort. It moves data around on the
disk
380 PRINT"rather than bringing it into memory. As a result, the
maximum
400 PRINT"file size is limited only by the amount of space remai
ning on
420 PRINT"your disk. The disadvantage is that it takes a good de
al
440 PRINT"longer to perform. A 400 record file, for example, tak
es about
460 PRINT"half an hour to sort. You should make sure that you ha
ve
480 PRINT"BACKED UP your disk before running this sort.
500 PRINT"You should sort the file before running the PRINT modu
le.
520 INPUT"Do you wish to sort this file now";E$:IFLEFT$(E$,1)="n
"ORLEFT$(E$,1)="N"THENRUN"MAGIDEX"
540 CLS
560 OPEN"R",1,"DIRECTRY/DAT"+D2$,32
580 IFLCTHENPOKE27208,&H40:POKE27209,&H3C:REM DIRECT BUFFER TO S
```

Listing 3 continues

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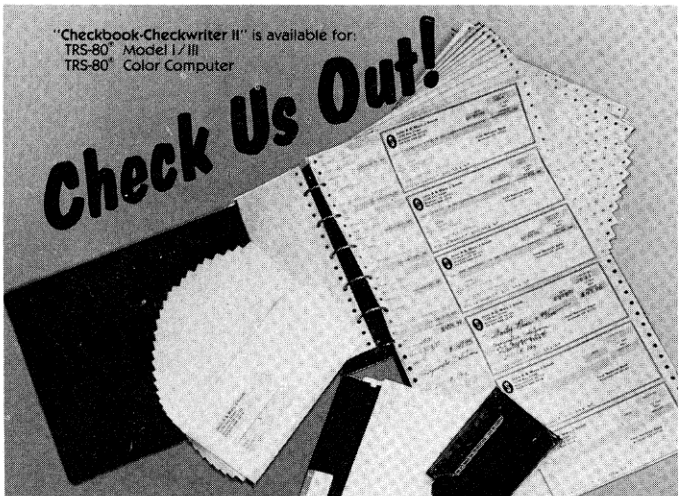

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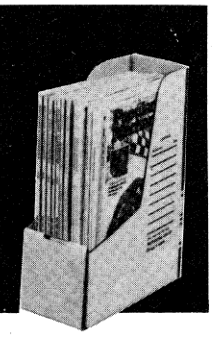

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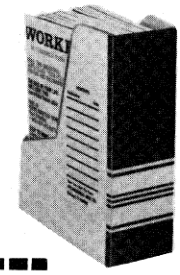

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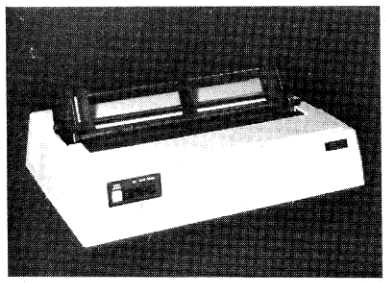

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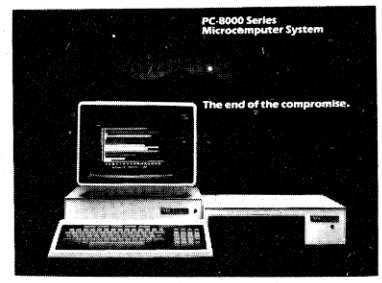

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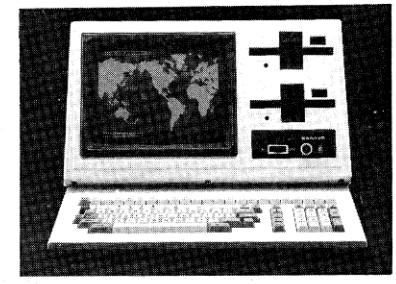

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Listing 3 continued

```
CREEN
600 FIELD1,32 AS A1$
620 M=IN
640 M=INT(M/2):PRINT@512,"Now making sort pass # ";USING"####";M
;:IFM=0THEN780ELSEJ=1:K=IN-M
660 I=J
680 L=I+M
700 GET1,I:V1$=A1$:GET1,L:V2$=A1$:IFV2$>=V1$THEN760
720 LSETA1$=V1$:PUT1,L:LSETA1$=V2$:PUT1,I
740 I=I-M:IFI>1THEN680
760 J=J+1:IFJ>KTHEN640ELSE660
780 CLOSE
800 RUN"MAGIDEX"
820 PRINT@512,"Initializing memory for sort.";:FORX=1TO800:E$(X)
=STRING$(32,191):NEXTX
840 PRINT@512,"Performing in-memory sort              "
860 IFLCTHENPRINT@128,"[[[[  String value being swapped  [[[[";
880 OPEN"R",1,"DIRECTRY/DAT"+D2$,32
900 FIELD1,32ASF1$
920 FORX=1TOIN
940 GET1,X
960 LSETE$(X)=F1$
980 NEXTX
1000 T$=STRING$(32,32)
1020 IFLCTHENPOKEVARPTR(T$)+2,&H3C:POKEVARPTR(T$)+1,0:REM POINT
T$ TO SCREEN
1040 LSETT$=STRING$(32,143)
1060 M=IN
1080 M=INT(M/2):PRINT@512+128,"Now making sort pass #";M;:IFM=0T
HEN1220ELSEJ=1:K=IN-M
1100 I=J
1120 L=I+M
1140 IFE$(I)<E$(L)THEN1200'680
1160 LSETT$=E$(I):LSETE$(I)=E$(L):LSETE$(L)=T$
1180 I=I-M:IFI>1THEN1120
1200 J=J+1:IFJ>KTHEN1080ELSE1100
1220 FORX=1TOIN
1240 LSETF1$=E$(X)
1260 PUT1,X
1280 NEXTX
1300 GOTO780
```

Program Listing 4

```
20 REM ******************************************************
40 REM ***  PRINT/BAS Copyright (C) 1981 by C. P. Knight    ***
60 REM ***  Module for use with the "MAGIDEX" directory     ***
80 REM ***  management system for LDOS operating system     ***
100 REM***  only.  ALL RIGHTS RESERVED                      ***
120 REM***                  Version 1.2                     ***
140 REM******************************************************
160 CLEAR5000:CLS:DEFINTA-Z
180 DIMAB$(7),MO$(12)
200 AB$(0)="Full":AB$(1)="Kill":AB$(2)="Rename":AB$(3)="*****":A
B$(4)="Write":AB$(5)="Read":AB$(6)="Exec":AB$(7)="None"
220 MO$(1)="Jan ":MO$(2)="Feb ":MO$(3)="Mar ":MO$(4)="Apr ":MO$(
5)="May ":MO$(6)="Jun ":MO$(7)="Jul ":MO$(8)="Aug ":MO$(9)="Sep
":MO$(10)="Oct ":MO$(11)="Nov ":MO$(12)="Dec ":MO$(0)="???"
240 ONERRORGOTO380
260 OPEN"I",1,"TRANSFER/DAT":INPUT#1,VI,D2,D2$,DN,IN,KT$
```

Listing 4 continues

Listing 4 continued

```
280 CLOSE1:ONERRORGOTO5000
300 GOTO420
320 PRINT@196,"Press <     > to display next page..............
.";
340 PRINT@203,"ENTER";:IK$=INKEY$:FORWL=1TO25:NEXTWL:PRINT@203,"
     ";:FORWL=1TO25:NEXTWL:IFIK$="["THEN360ELSEIFIK$<>CHR$(13)TH
EN340ELSEPRINT@196,STRING$(50,32);:RETURN
360 CLOSE1:CLOSE2:PRINT@196,STRING$(50,32);:GOTO980
380 IFERR=106THENRESUME400ELSECMD"E":STOP
400 ONERRORGOTO5000:CLS:PRINT@512,"File TRANSFER/DAT not in syst
em. Returning to menu":RUN"MAGIDEX"
420 G1$=STRING$(64,191):G2$=STRING$(2,191)+STRING$(60,32)+STRING
$(2,191):G3$=STRING$(2,191)+STRING$(60,143)+STRING$(2,191):G4$=S
TRING$(2,191)+STRING$(60,188)+STRING$(2,191)
440 CLS:PRINTG3$G2$G2$G2$G4$
460 GOSUB520:R2=LOF(2):CLOSE2:GOTO980
480 OPEN"RO",1,"DIRECTRY/DAT"+D2$,32
500 FIELD1,12 AS F1$ ,2 AS F2$,2 AS F3$,1 AS F4$,1 AS F5$,1 AS F
6$,2 AS F7$,2 AS F8$,2 AS F9$,4 AS F0$,2 AS FA$,1 AS FB$
520 OPEN"RO",2,"HEADER/DAT"+D2$,25
540 FIELD2,16 AS FC$,2 AS FD$,2 AS FE$,1 AS FF$,1 AS FG$,1 AS FH
$,2 AS FJ$
560 RETURN
580 REM *********  MAIN FILE READ ROUTINE ****************
600 GET1,NF
620 NH=CVI(F3$)'GET POINTER TO HEADER FILE
640 NQ$="Disk #"+STR$(CVI(F3$))
660 GET2,NH'GET HEADER FILE RECORD FOR THIS FILE
680 NA$=F1$:AB$=AB$(CVI(F2$)):AB$="Access level = "+AB$
681 X0$=NA$+" Prot= "+AB$(CVI(F2$))
700 UP$=F5$:IFUP$=" "THENUP$="No access password"ELSEIFUP$="#"TH
ENUP$="Access password = Password"ELSEUP$="Access password requi
red"
720 AP$=F4$:IFAP$=" "THENAP$="No update password"ELSEIFAP$="#"TH
ENAP$="Update password = password"ELSEAP$="Update password requi
red"
721 X5$=UP$+" "+AP$
740 MF$=F6$:IFMF$="+"THENMF$="File NOT backed up!"ELSEMF$="File
backed up."
760 EL=ASC(FB$)+1:EL$="Logical record length ="+STR$(EL)
761 X6$=MF$+" "+EL$
780 SZ$="File consumes "+STR$(CVI(FA$))+" grans or "+STR$(CVS(F0
$))+"K of disk space"
800 MO=CVI(F7$):DA=CVI(F8$):YR=CVI(F9$):DT$="File's date = "+MO$
(MO)+"-"+STR$(DA)+" -"+STR$(YR):IFMO<=0ORMO>12ORDA<=0ORDA>31THEN
DT$="*** Invalid date ***"
801 X7$=STR$(CVI(FA$))+" Grans "+STR$(CVS(F0$))+"K. "+DT$
820 REM **********  CONVERT HEADER FILE DATA ************
840 TV$=FC$:NH$=LEFT$(TV$,8):TV$=RIGHT$(TV$,8):DH$=MO$(VAL(LEFT$
(TV$,2)))+MID$(TV$,3,4)+STR$(VAL(RIGHT$(TV$,2))+1900):REM DISK N
AME & DATE
860 K1$="Diskette has "+STR$(CVI(FD$))+" Free grans or "+STR$(CV
I(FE$))+"K of free space"
861 X1$=NQ$+" "+DH$+" free"+STR$(CVI(FD$))+" Grans"+STR$(CVI(FE$
))+"K"
880 IFFF$="S"THENSD$="Diskette is formatted in single density"EL
SESD$="Diskette is formatted in double density"
881 IFFF$="S"THENTV$="Single density"ELSETV$="Double density"
882 X2$=TV$
900 IFFG$="8"THEND8$="Diskette is an 8 inch floppy"ELSED8$="Disk
ette is a 5 inch mini-floppy"
901 X2$=X2$+" "+FG$+CHR$(34)+" "
```

Listing 4 continues

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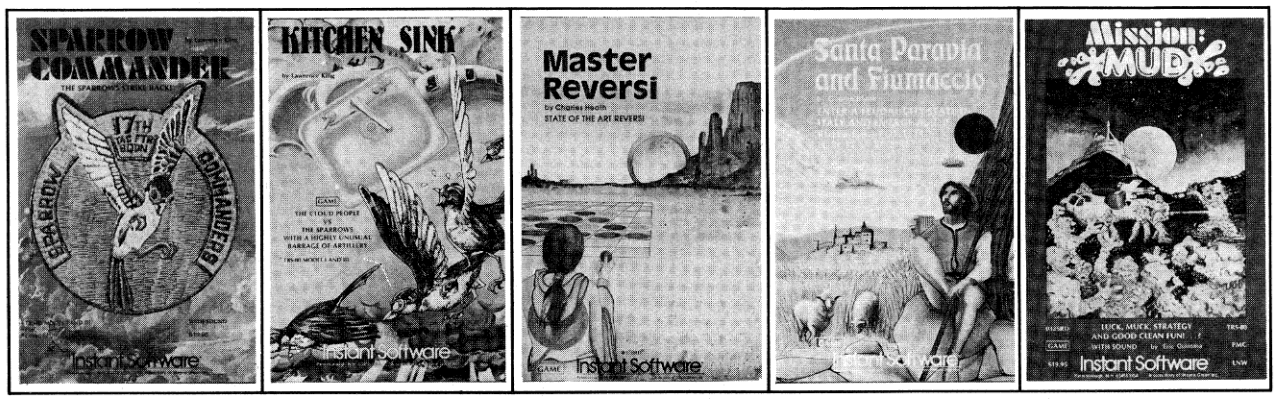

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Listing 4 continued

```
920 IFFH$="2"THENS2$="Diskette is double sided"ELSES2$="Diskette
 is single sided"
921 IFFH$="2"THENTV$="double sided"ELSETV$="single sided"
922 X2$=X2$+TV$
940 NT$="Diskette is formatted for "+FJ$ +" cylinders"
941 X2$=X2$+" "+FJ$+" cylinders"
960 RETURN
980 PRINT@320,CHR$(31);:PN=0:PRINT@66,STRING$(59,32);
1000 PRINT@132,"Magidex printout program (C) 1981 by Charles P.
Knight";
1020 PRINT@208,IN;"files in system";R2;"disks";
1040 PRINT@384,"      <1> ........... Print file to printer"
1060 PRINT"      <2> ........... Search for specific file"
1080 PRINT"      <3> ........... Print file to screen
1100 PRINT"      <4> ........... Return to master menu"
1120 PRINT"      <5> ........... Printout of Header data"
1140 PRINT"      <6> ........... Printout of files by disk"
1160 PRINTSTRING$(64,140);
1180 PA=960
1200 PRINT@832,KT$",";
1220 IK$=INKEY$:PRINT@896,"Please key your selection. Don't pres
s enter.";
1240 IFIK$<>""THEN1320
1260 PRINT@PA,"[";:PRINT@PA-1," ";
1280 PA=PA+1:IFPA>1005THENPA=960:PRINT@1005," ";
1300 FORWL=1TO5:NEXTWL
1320 IFIK$<"1"ORIK$>"6"THEN1220
1340 IK=VAL(IK$)
1360 ONIKGOTO1400,2160,3000,3220,3240,3880
1380 REM  ********* Print files to printer ****************
1400 IP$="":PG=1:PRINT@320,CHR$(31);:PRINT@320,"Press <ENTER> tw
ice to print whole file":INPUT"Beginning record #";IP$:A1=VAL(IP
$):IFA1<0ORA1>IN THEN1400
1420 INPUT"Ending record #";IP$:A2=VAL(IP$):IFA2<A1ORA2>IN THEN1
400:IFIP$=""THENA2=IN:A1=1:NF=0
1440 NF=A1-1:IFNF<0THENNF=0
1460 IFIP$=""THENA2=IN:A1=1:NF=0
1480 PRINT"You may use either LONG or SHORT form printout.":PRIN
T"Enter "CHR$(34)"S"CHR$(34)" for short form output (Default = l
ong)";:INPUTIP$
1500 IFIP$="S"ORIP$="s"THENSK=-1ELSESK=0
1501 IP$="":INPUT"Start numbering pages from what page number";I
P$:IFIP$=""THENPG=1
1502 IFIP$<>""THENPG=VAL(IP$):IFPG>32000THEN1501
1520 GOSUB480:GOSUB2120:PRINT@320,CHR$(31);
1540 NF=NF+1:REM INCREMENT RECORD NUMBER
1560 GOSUB600:REM       READ RECORD INTO BUFFER
1580 LPRINTSTRING$(63,"-")
1600 IFSKTHENLPRINTNA$" "NQ$" "NH$"  "DT$:GOTO1820
1620 LPRINTX0$"  "X7$
1640 LPRINTTAB(9)X5$
1660 LPRINTTAB(9);X6$
1680 LPRINTTAB(9);X1$;"  ";NH$
1700 LPRINTTAB(9);X2$
1820 PRINT@320,CHR$(31);:PRINT@320,NA$;" ";AB$" ";NQ$" "NF;
1840 PRINT@390,AP$" - "UP$;
1860 PRINT@454,SZ$;
1880 PRINT@518,MF$;" ";EL$;
1900 PRINT@582,DT$;
1920 PRINT@646,SD$;
1940 PRINT@710,NT$;
1960 PRINT@774,D8$;
```

Listing 4 continues

Listing 4 continued

```
1980 PRINT@838,S2$;
2000 PRINT@902,K1$;
2020 PRINT@966,"Disk name & date -->  ";NH$;"     "DH$;
2040 IFPEEK(16425)>53THENPG=PG+1:LPRINTSTRING$(63,"-"):LPRINTCHR
$(12):GOSUB2120
2060 IK$=INKEY$:IFIK$="["THENLPRINTSTRING$(63,"="):LPRINTCHR$(12
):CLOSE1:CLOSE2:GOTO980
2080 IFNF>=A2 THENCLOSE1:CLOSE2:LPRINTCHR$(12):GOTO980
2100 GOTO1540
2120 LPRINTSTRING$(63,"="):LPRINT"Diskette library of ";KT$;"  D
ATE "LEFT$(TIME$,8);:LPRINTUSING" Page ####";PG:LPRINTSTRING$(63
,"=")
2140 RETURN
2160 NF=0:PG=0:REM **********    SEARCH FOR PARTSPEC
2180 GOSUB480:PRINT@320,CHR$(31);:PRINT@384,"Instring search fun
ction.";
2200 PRINT@448,;:INPUT"Enter the filespec or partspec to be foun
d";A1$:
2220 IFLEN(A1$)>13ORLEN(A1$)<1THEN2200
2240 INPUT"Do you wish output to your printer";LP$:IFLEFT$(LP$,1
)="y"ORLEFT$(LP$,1)="Y"THENLP=-1ELSELP=0
2260 IFLPANDNOTPGTHENPG=1:GOSUB2960
2280 PRINT@69,"Search string ----> ";A1$;
2300 IFLEFT$(A1$,1)="["THENCLOSE1:CLOSE2:GOTO980
2320 NF=NF+1
2340 GET1,NF
2360 CP$=F1$
2380 IFINSTR(CP$,A1$)THEN2460
2400 IFNF>=IN THENCLOSE1:CLOSE2:IFLPTHENLPRINTSTRING$(63,"="):LP
RINTCHR$(12):GOTO980ELSE980
2420 IFINKEY$="["THENCLOSE1:CLOSE2:IFLPTHENLPRINTCHR$(12):GOTO98
0ELSEGOTO980
2440 GOTO2320
2460 GOSUB600
2480 PRINT@320,CHR$(31);:PRINT@320,NA$;" ";AB$;" ";NQ$;" ";NF;
2500 PRINT@390,AP$" UP$;
2520 PRINT@454,SZ$;:PRINT@518,MF$;" ";EL$;
2540 PRINT@582,DT$;:PRINT@646,SD$;:PRINT@710,NT$;:PRINT@774,D8$;
2560 PRINT@838,S2$;:PRINT@902,K1$;
2580 PRINT@966,"Disk name & date -->  "NH$"  "DH$;
2600 IFNOTLPTHENGOSUB320
2620 IFLPTHENGOSUB2660
2640 GOTO2320
2660 LPRINTSTRING$(63,"=")
2680 LPRINTNA$" "AB$" "NQ$" Record #";NF
2700 LPRINTTAB(9);AP$" - "UP$
2720 LPRINTTAB(9);SZ$
2740 LPRINTTAB(9);MF$"  "EL$
2760 LPRINTTAB(9);DT$
2780 LPRINTTAB(9);SD$
2800 LPRINTTAB(9);NT$
2820 LPRINTTAB(9);D8$
2840 LPRINTTAB(9);S2$
2860 LPRINTTAB(9);K1$
2880 LPRINTTAB(9);"Disk name & date -->"NH$"  "DH$
2900 IFPEEK(16425)>50THENPG=PG+1:LPRINTSTRING$(63,"="):LPRINTCHR
$(12):GOSUB2960
2920 IFINKEY$="["THENLPRINTSTRING$(63,"="):CLOSE1:CLOSE2:GOTO980
2940 RETURN
2960 LPRINTSTRING$(63,"="):LPRINT"Disk library of ";KT$;" DATE "
LEFT$(TIME$,8)"  page"PG:LPRINT"Search string ------> "A1$:RETUR
N
```

Listing 4 continues

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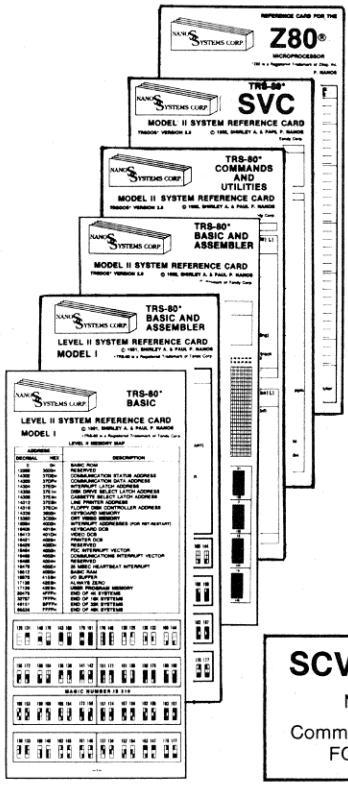

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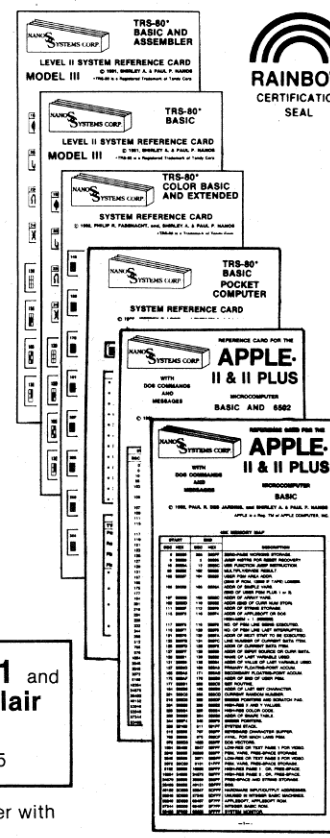

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Listing 4 continued

```
2980 REM *************** Print entire file to screen **********
3000 NF=0:GOSUB480:PRINT@320,CHR$(31);:REM Open files
3040 NF=NF+1:GOSUB600
3050 PRINT@320,CHR$(31);
3060 PRINT@320,NA$;" "AB$;"  "NQ$;" Record #";NF;
3080 PRINT@390,AP$;" - ";UP$;
3100 PRINT@454,SZ$;:PRINT@518,MF$;" ";EL$;
3120 PRINT@582,DT$;
3140 PRINT@646,SD$;:PRINT@710,NT$;:PRINT@774,D8$;:PRINT@838,S2$;
:PRINT@902,K1$;:PRINT@966,"Disk name & date --> ";NH$"     "DH$;

3160 GOSUB320
3180 IFNF>=IN THENCLOSE1:CLOSE2:GOTO980
3200 GOTO3040
3220 CLOSE:CLEAR50:RUN"MAGIDEX"
3240 GOSUB520:PG=0:DN=0:REM  ******** Printout of Header/dat
3260 PRINT@320,CHR$(31);:PRINT@320,"Pressing <ENTER> twice print
s all disks"
3280 INPUT"Enter starting disk number";IP$:S1=VAL(IP$):INPUT"End
ing disk number";IP$:S2=VAL(IP$)
3300 IFS1<0ORS2<0ORS1>R2ORS2>R2THEN3260
3320 IFS1<=1THENS1=1
3340 IFS2>=R2ORS2<=0THENS2=R2
3360 INPUT"Do you wish output to your printer";LP$:IFLEFT$(LP$,1
)="y"ORLEFT$(LP$,1)="Y"THENLP=-1ELSELP=0
3380 IFLPANDNOTPGTHENGOSUB3820
3400 FORDN=S1TOS2
3420 PRINT@320,CHR$(31);
3440 IFINKEY$="["THENCLOSE1:CLOSE2:IFLPTHENLPRINTCHR$(12):GOTO98
0ELSE980
3460 GET2,DN
3480 GOSUB840:REM
3500 PRINT@384,"Disk name & date ---> ";NH$;"   "DH$;
3520 PRINT@454,SD$;
3540 PRINT@518,NT$;
3560 PRINT@582,D8$;
3580 PRINT@646,S2$;
3600 PRINT@710,K1$;
3620 PRINT@774,"Disk number --->"DN;
3640 IFLPTHENGOSUB3720ELSEGOSUB320
3660 NEXTDN
3680 CLOSE1:CLOSE2:IFLPTHENLPRINTCHR$(12)
3700 GOTO980
3720 IFPEEK(16425)>50THENLPRINTCHR$(12):GOSUB3820
3740 LPRINT"Disk name & date ----> ";NH$"   ";DH$
3760 LPRINTTAB(9);SD$:LPRINTTAB(9);NT$:LPRINTTAB(9);D8$:LPRINTTA
B(9);S2$:LPRINTTAB(9);K1$:LPRINTTAB(9);"Disk number ---->";DN
3780 LPRINTSTRING$(63,"-")
3800 RETURN
3820 PG=PG+1:LPRINTSTRING$(63,"="):LPRINT"Names of disks in libr
ary ot "KT$" page";PG
3840 LPRINTSTRING$(63,"=")
3860 RETURN
3880 IP$="":GOSUB480:S3=LOF(2):PRINT@320,CHR$(31);:PRINT@320,"Pr
essing <ENTER> twice prints entire file":INPUT"Enter starting di
sk number";IP$:S1=VAL(IP$):INPUT"Enter ending disk number";IP$:S
2=VAL(IP$)
3900 PN=0:IFS1<0ORS2<0ORS1>S2ORS1>S3ORS2>S3THEN3880
3920 IFS1<=0THENS1=1
3940 IFS2>=S3ORS2<=0THENS2=S3
3960 INPUT"Do you wish output to your printer";L$:IFLEFT$(L$,1)=
```

Listing 4 continues

Listing 4 continued

```
"y"ORLEFT$(L$,1)="Y"THENLP=-1:PF=-1ELSELP=0:PF=0
3980 FORDN=S1TOS2:REM SEARCH DISK NUMBERS
4000 PRINT@320,CHR$(31);
4020 GET2,DN
4040 TV$=FC$:NH$=LEFT$(FC$,8):TV$=RIGHT$(TV$,8):DH$=MO$(VAL(LEFT
$(TV$,2)))+"-"+MID$(TV$,3,4)+STR$(VAL(RIGHT$(TV$,2))+1900):REM N
AME & DATE
4060 K1$="Diskette has "+STR$(CVI(FD$))+" free grans or "+STR$(C
VI(FE$))+"K of free space"
4080 IFFF$="S"THENSD$="Diskette is formatted in single density"E
LSESD$="Diskette is formatted in double density"
4100 IFFG$="8"THEND8$="Diskette is an 8 inch floppy"ELSED8$="Dis
kette is a 5 inch mini-floppy"
4120 IFFH$="2"THEN S2$="Diskette is double sided"ELSE S2$="Diske
tte is single sided"
4140 NT$="Diskette is formatted for "+FJ$+" Cylinders."
4160 PRINT@320,NH$" "DH$" DISK #";DN;:PRINT@384,K1$;:PRINT@448,S
D$;:PRINT@512,D8$;:PRINT@576,S2$;:PRINT@640,NT$;
4180 IFPFANDLPTHENGOSUB4740:PF=0
4200 FORNF=1TO IN :IFINKEY$="["THEN980:REM  SEARCH ALL FILES
4220 GET1,NF
4240 NH=CVI(F3$):IFNH<>DNTHEN 4480
4260 NA$=F1$:AB$=AB$(CVI(F2$)):AB$="Access level "+AB$
4280 UP$=F5$:IFUP$=" "THENUP$="No access password."ELSEIFUP$="#"
THENUP$="Access password = Password."ELSEUP$="Access password re
quired."
4300 AP$=F4$:IFAP$=" "THENAP$="No update password."ELSEIFAP$="#"
THENAP$="Update password = Password."ELSEAP$="Update password re
quired."
4320 MF$=F6$:IFMF$="+"THENMF$="File NOT backed up!"ELSEMF$="File
 backed up."
4340 EL=ASC(FB$)+1:EL$="Logical record length ="+STR$(EL)
4360 SZ$=STR$(CVI(FA$))+" grans "+STR$(CVS(F0$))+"K."
4380 MO=CVI(F7$):DA=CVI(F8$):YR=CVI(F9$):DT$="File's date = "+MO
$(MO)+"-"+STR$(DA)+" -"+  STR$(YR):IFMO<=0ORDA<=0ORDA>31THENDT$=
"*** Invalid date ***"
4400 PRINT@704,CHR$(31);:PRINT@704,STRING$(64,140);:PRINT@768,NA
$;"  "AB$;"  "SZ$;:PRINT@832,UP$;"  ";AP$;" Rec. #";NF;:PRINT@89
6,DT$;" "MF$;:PRINT@960,EL$;
4420 IFNOTLPTHENGOSUB320
4440 IFLPTHENGOSUB4600
4460 IFINKEY$="["THENCLOSE1:CLOSE2:LPRINTCHR$(12):GOTO980
4480 IFNF<=IN THEN NEXT NF
4500 IFLPTHENLPRINTCHR$(12):GOSUB4740
4520 NEXTDN
4540 CLOSE1:CLOSE2
4560 IFLPTHENLPRINTCHR$(12)
4580 GOTO980
4600 IFPEEK(16425)>53THENLPRINTCHR$(12):GOSUB4740
4620 LPRINTNA$"  "AB$"  "SZ$"Rec #";NF
4640 LPRINTTAB(9);UP$;"   "AP$
4660 LPRINTTAB(9);DT$"  "MF$
4680 LPRINTTAB(9);EL$
4700 LPRINTSTRING$(63,"-")
4720 RETURN
4740 PN=PN+1:REM PRINT DISK HEADER INFORMATION AT TOF
4760 LPRINTSTRING$(63,"="):LPRINT"Disk library of "KT$;"  ";LEFT
$(TIME$,8);TAB(50)"Page ";PN
4780 LPRINTSTRING$(63,"=")
4800 LPRINTNH$;"  ";DH$;" --> Disk No."DN
4820 LPRINTK1$
```

Listing 4 continues

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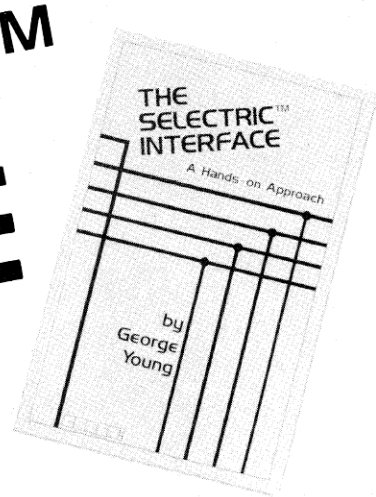

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Listing 4 continued

```
4840 LPRINTSD$
4860 LPRINTD8$
4880 LPRINTS2$
4900 LPRINTNT$
4920 LPRINTSTRING$(63,"=")
4940 RETURN
5000 CLS:PRINT@512,"An error has occurred!":PRINT"Error # "ERR"
in line "ERL:PRINT"DOS ERROR : ";:CMD"E"
5010 INPUT"Press <ENTER> to return to menu";ZC$
5030 CLOSE:RESUME420
```

Program Listing 5

```
20 REM ******************************************************
40 REM ***    DREADER/BAS - Diskette directory reading      ***
60 REM ***  program for LDOS operating system. Reads disk   ***
80 REM ***    and creates data files containing directory   ***
100 REM***      information. COPYRIGHT (c) 1982   by         ***
120 REM***     Charles P. Knight. ALL RIGHTS RESERVED        ***
140 REM***  at least two disk drives required 3 preferred   ***
160 REM***                Version 1.2                        ***
180 REM******************************************************
200 REM
220 CLEAR2000:DIMAB$(7),MO$(12)
240 AB$(0)="Full":AB$(1)="Kill":AB$(2)="Rename":AB$(3)="*****":A
B$(4)="Write":AB$(5)="Read":AB$(6)="Exec":AB$(7)="None"
260 MO$(1)="Jan ":MO$(2)="Feb ":MO$(3)="Mar ":MO$(4)="Apr ":MO$(
5)="May ":MO$(6)="Jun ":MO$(7)="Jul ":MO$(8)="Aug ":MO$(9)="Sep
":MO$(10)="Oct ":MO$(11)="Nov ":MO$(12)="Dec "
280 DEFFNS$(X$)=LEFT$(X$,INSTR(X$+" "," ")-1)
300 DEFFND$(X)=":"+RIGHT$(STR$(X),1)
320 REM          Initialize
340 GOSUB2620
360 PRINT@135,"DREADER/BAS.  COPYRIGHT (C) 1981 BY C. P. KNIGHT"
;
380 GOSUB2920
400 PRINT@771,"Enter your name, please :";:S=798:E=S+20:GOSUB270
0:KT$=A$:IFKT$=""THEN400ELSEPRINT@771,STRING$(59,32);
420 PRINT@771,"Do you wish to include invisible files";:S=810:E=
S+3:GOSUB2700::IFA$="y"ORA$="Y"THENVI=-1ELSEVI=0
440 IFDN<1THENDN=1
460 PRINT@835,"What drive will the directory file be written on"
;:S=884:E=S+1:GOSUB2700:D2=VAL(A$):IFD2>3ORD2<0THEN460
480 D2$=FND$(D2)
500 PRINT@899,"Do you want to print disk labels as the disks are
 read";:S=954:E=S+3:GOSUB2700:IFLEFT$(A$,1)="y"ORLEFT$(A$,1)="Y"
THENLP=-1ELSELP=0
520 FORTV=771TO899STEP64:PRINT@TV,CHR$(251);:NEXTTV
540 PRINT@835,"Enter drive containing disk no "DN;:PRINT@899,"En
ter "CHR$(34)"@"CHR$(34)" when finished entering";:S=873:E=S+1:G
OSUB2700:IFA$="@"THEN3020ELSED1=VAL(A$):IFD1<0ORD1>3THEN540
560 FORTV=322TO704STEP64:PRINT@TV,CHR$(251);:NEXTTV
580 D1$=FND$(D1)
600 FORTV=66TO256STEP64:PRINT@TV,CHR$(250);:NEXTTV:GOSUB2200
620 REM          Loop through directory ****************
640 GOSUB1680:GOSUB1860:PRINTEE"Free granules"EK"K";
660 OPEN"RO",1,"DIR/SYS.RS0LT0FF"+D1$,32
```

Listing 5 continues

Listing 5 continued

```
680 SD=PEEK(18179+(10*D1)):IFSDAND64THENSD$="Double Density"ELSE
SD$="Single Density"
700 IFSDAND32THEND8$="8"+CHR$(34)+" Floppy"ELSED8$="5"+CHR$(34)+
" Floppy"
720 SS=PEEK(18180+(10*D1)):IFSSAND32THENS2$="Double sided"ELSES2
$="Single Sided"
740 NT$=STR$(PEEK(18182+(10*D1))+1)+" Cyls":NT$=RIGHT$(NT$,LEN(N
T$)-1)
760 PRINT@197,SD$" "S2$" "D8$" "NT$;
780 GOSUB2360
800 IFLPTHENGOSUB2520
820 FIELD1,1ASXF$,1ASZ1$,1ASZ2$,1ASZ3$,1ASZ4$,8ASXN$,3ASXE$,2ASX
1$,2ASX2$,2ASX3$,10ASXX$
840 Q=387
860 FORI=17TOLOF(1)
880 GET 1,I
900 IF(ASC(XF$)AND144)<>16THEN1300:REM EXIT IF KILLED OR IF FXDE
920 IF(ASC(XF$)AND8)ANDNOTVITHEN1300:REM CHECK VISIBILITY
940 IFASC(XF$)AND64THEN1300:REM EXIT IF SYSTEM FILE
960 N$=FNS$(XN$)+"/"+FNS$(XE$)
980 GOSUB1380:GOSUB1440
1000 X1=CVI(X1$):X2=CVI(X2$):X3=CVI(X3$)
1020 Z0=ASC(XF$):Z1=ASC(Z1$):Z2=ASC(Z2$):Z3=ASC(Z3$):Z4=ASC(Z4$)
1040 IFZ4=0THENZ4=256
1060 IFX1=17046THENTT$=" .":AP$=" "ELSEIFX1=17120THENTT$="#.":AP
$="#"ELSETT$="P.":AP$="P"
1080 N$=N$+STRING$(14-LEN(N$),32)+TT$:IFMTHENMID$(N$,13,1)="+":M
F$="+":ELSEMF$=" "
1100 IFX2=17046THENTT$=" .":UP$=" "ELSEIFX2=17120THENTT$="#.":UP
$="#"ELSETT$="P.":UP$="P"
1120 N$=N$+TT$+" "+AB$
1140 IFMID$(N$,INSTR(N$,"/")+1,1)=" "THENMID$(N$,INSTR(N$,"/"),1
)=" "
1160 PRINT@Q,CHR$(251);:PRINT@Q+64,CHR$(251);
1180 PRINT@Q,"Reading file : ";N$"   "DA$;
1200 IN=IN+1:PRINT@880,"Files:";IN;
1220 GOSUB1560
1240 PRINT@Q+64,"File length ="FS "      <"NG"> Granules"NK"K  L
RL="Z4;
1260 GOSUB2260
1280 Q=Q+192:IFQ>640THENQ=387
1300 NEXT I
1320 CLOSE1:CLOSE2
1340 DN=DN+1:GOTO540
1360 REM          DETERMINE ATTRIBUTES OF FILE
1380 AB$=AB$(ASC(XF$)AND7):AB=ASC(XF$)AND7
1400 RETURN
1420 REM          DATE CALCULATIONS
1440 DA$="":IFASC(Z1$)AND16THENDA$="Invalid date":RETURN
1460 YR=ASC(Z2$)AND7:TV=YR:YR=1980+YR
1480 DA=(ASC(Z2$)AND248)/8:MO=ASC(Z1$)AND15:DA$=MO$(MO)+STR$(DA)
+STR$(YR)
1500 IFDA<=0ORMO<=0THENDA$="Invalid date"
1520 IFASC(Z1$)AND64THENM=-1ELSEM=0:REM NOTE MOD STATUS
1540 RETURN
1560 REM         CALCULATE FILE SIZE
1580 NS=X3:NK=(NS*1280):NK=INT(NK/100)/10
1600 IFNS<=5THENNS=1:NG=NS:ELSENS=INT(NS/5+.9):NG=NS
1620 NK=NG*1.25:NK=INT(NK*10+.49)/10
1640 FS=((X3-1)*256)+(Z3-1):IFFS<0THENFS=0
```

Listing 5 continues

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Listing 5 continued

```
1660 RETURN
1680 REM        GET DISK NAME, PASSWORD, AND DATE
1700 ONERRORGOTO3160:OPEN"RO",1,"DIR/SYS.RS0LT0FF"+D1$,32
1720 ONERRORGOTO3340
1740 FIELD1,16ASNO$,16ASXN$
1760 GET1,7
1780 DN$=XN$:DN$=LEFT$(DN$,8):DN$=DN$+" - "+RIGHT$(XN$,8)
1800 PRINT@133,DN$"    ";
1820 CLOSE1
1840 RETURN
1860 OPEN"RO",3,"DIR/SYS.RS0LT0FF"+D1$,1
1880 FIELD3,1ASRR$
1900 EE=0
1920 FORX=1TO95
1940 GET3,X
1960 TV=ASC(RR$)
1980 IFNOTTVAND1THENEE=EE+1
2000 IFNOTTVAND2THENEE=EE+1
2020 IFNOTTVAND4THENEE=EE+1
2040 IFNOTTVAND8THENEE=EE+1
2060 IFNOTTVAND16THENEE=EE+1
2080 NEXTX
2100 CLOSE3
2120 IFPEEK(18179+(10*D1))AND64THENEK=EE*1.5ELSEEK=EE*1.26
2140 EK=INT(EK)
2160 RETURN
2180 REM        Write directory file to disk
2200 OPEN"R",2,"DIRECTRY/DAT"+D2$,32
2220 FIELD2,12 AS K1$,2 AS K2$,2 AS K3$,1 AS K8$,1 AS K9$,1 AS K
0$,2 AS L1$,2 AS L2$,2 AS L3$,4 AS L4$,2 AS L5$,1 AS EW$
2240 RETURN
2260 LSETK1$=N$:LSETK2$=MKI$(AB):LSETK3$=MKI$(DN):LSETK8$=AP$:LS
ETK9$=UP$:LSETK0$=MF$
2280 LSETL1$=MKI$(MO):LSETL2$=MKI$(DA):LSETL3$=MKI$(YR):LSETL4$=
MKS$(NK):LSETL5$=MKI$(NG):LSETEW$=CHR$(Z4-1)
2300 PUT2,IN
2320 RETURN
2340 REM WRITE HEADER FILE DATA
2360 OPEN"R",3,"HEADER/DAT"+D2$,25
2380 FIELD3,16 AS J1$,2 AS J2$,2 AS J3$,1 AS J4$,1 AS J5$,1 AS J
6$,2 AS J7$
2400 LSETJ1$=LEFT$(DN$,8)+RIGHT$(DN$,8)
2420 LSETJ2$=MKI$(EE):LSETJ3$=MKI$(EK)
2440 LSETJ4$=SD$:LSETJ5$=D8$:LSETJ6$=S2$:LSETJ7$=NT$
2460 PUT3,DN
2480 CLOSE3
2500 RETURN
2520 LPRINT"Disk #"DN" "DN$
2540 LPRINTSD$" "S2$:LPRINTD8$" "NT$
2560 LPRINT"Free Grans :"EE" Free Space:"EK"K."
2580 LPRINT:LPRINT
2600 RETURN
2620 CLS
2640 G1$=STRING$(64,191):G2$=STRING$(2,191)+STRING$(60,32)+STRIN
G$(2,191):G3$=STRING$(2,191)+STRING$(60,140)+STRING$(2,191)
2660 PRINTG1$G2$G2$G2$G3$G2$G2$G2$G2$G2$G2$G3$G2$G2$G2$LEFT$(G1$
,63);:POKE16383,191
2680 RETURN
2700 C=E+1-S:A$="":PRINT@S,STRING$(C,95);:M1=S
2720 PRINT@M1,CHR$(63);:X$=INKEY$:PRINT@M1,CHR$(95);:IFX$=""THEN
2720
```

Listing 5 continues

Listing 5 continued

```
2740 IFX$=CHR$(13)THEN2780ELSEIFX$=CHR$(8)THENGOSUB2860ELSEGOSUB
2800
2760 GOTO2720
2780 A$=LEFT$(A$,C):PRINT@M1,STRING$(C-LEN(A$),32);:RETURN
2800 IFASC(X$)<32ORASC(X$)>122THENRETURN
2820 PRINT@M1,X$;:A$=A$+X$:M1=M1+1:IFM1>ETHENM1=E
2840 RETURN
2860 M1=M1-1:IFM1<STHENM1=S
2880 PRINT@M1,CHR$(95);
2900 A$=LEFT$(A$,M1-S):RETURN
2920 ONERRORGOTO3100
2940 OPEN"I",1,"TRANSFER/DAT"
2960 INPUT#1,VI,D2,D2$,DN,IN,KT$
2980 CLOSE
3000 GOTO500
3020 OPEN"O",1,"TRANSFER/DAT"+D2$
3040 PRINT#1,VI","D2","D2$","DN","IN","KT$
3060 CLOSE
3080 RUN"MAGIDEX"
3100 RESUME3140
3120 PRINT"UNRECOVERABLE ERROR":CMD"E":GOTO3060
3140 ONERRORGOTO3340:GOTO400
3160 RESUME3180
3180 ONERRORGOTO3340:RP$="REPAIR "+D1$+"(ALIEN)
3200 ONERRORGOTO3340:PRINT@835,"Directory not readable by LDOS.
Do you wish to attempt";:PRINT@899,"to repair it? (REPAIR/CMD mu
st be in system!)";
3220 S=945:E=948:GOSUB2700
3240 IFLEFT$(A$,1)="y"ORLEFT$(A$,1)="Y"THENONERRORGOTO3320:CMDRP
$:GOTO3280
3260 CLOSE2:FORTV=771TO899STEP64:PRINT@TV,CHR$(250);:NEXTTV:GOTO
540
3280 PRINT@512,"Repair complete. Press <ENTER> to resume executi
on.";:INPUTX$
3300 CLS:CLOSE2:GOSUB2660:GOTO540
3320 PRINT"Disk not repairable to LDOS specifications. Press <EN
TER>!":PRINT"Check to see that it is not write protected";:INPUT
X$:CLS:CLOSE2:GOSUB2660:GOTO540
3340 CLS:PRINT@512,"Error #"ERR"Line #"ERL:CMD"E":PRINT"RETURNIN
G TO MENU & CLOSING FILES.":RESUME3020
```

Program Listing 6

```
20 REM ***************************************************
40 REM ***   Utility/bas Utility for repairing or      ***
60 REM ***   updating the file TRANSFER/DAT in the     ***
80 REM ***   MAGIDEX disk directory management system  ***
100 REM***   (C) copyright 1982 by Charles P. Knight   ***
120 REM***   All rights reserved                       ***
140 REM***************************************************
160 CLEAR500:CLS
180 OPEN"I",1,"TRANSFER/DAT"
200 INPUT#1,VI,D2,D2$,DN,IN,KT$
220 CLS:PRINT:PRINT"The status of your system is :"
240 IFVITHENVI$="yes"ELSEVI$="no"
260 PRINT"{1.}  Directory of : ";KT$
280 PRINT"{2.}  Data on drive # ";D2$
300 PRINT"{3.}  Number of entries in file : ";IN
```

Listing 6 continues

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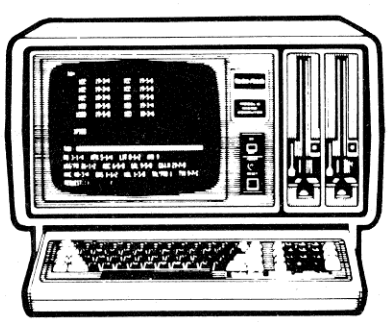

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Listing 6 continued

```
320 PRINT"{4.}  Invisible files recorded : ";VI$
340 PRINT"{5.}  Number of disks in system";DN
360 PRINT"{6.}  Save status as it is and return to MAGIDEX"
380 PRINT"{7.}  Abort to MAGIDEX without saving changes
400 PRINT:PRINT"KNOW what you are doing before changing anything
!"
420 INPUT"Which item do you want to change";IP$
440 X=VAL(IP$):IFX<1ORX>7THENCLS:GOTO220
460 ONXGOTO480,540,640,740,760,820,900
480 PRINT"Name = "KT$" input new name"
500 INPUTNA$:IFNA$=""THENCLS:GOTO220
520 KT$=NA$:GOTO220
540 PRINT"Data is currently on drive "D2$". Input new drive no."

560 INPUTIP$:IP$=RIGHT$(IP$,1)
580 X=VAL(IP$)IFX<0ORX>7THENCLS:GOTO220
600 D2$=":"+RIGHT$(STR$(X),1)
620 GOTO220
640 PRINT"BE CAREFUL HERE!!!!"
660 PRINT"There are"IN" records in the system."
680 INPUT"enter the new number of records";X$
700 X=VAL(X$):IFX<0ORX>32767THENCLS:GOTO220
720 IN=X:CLS:GOTO220
740 VI=(NOT VI):GOTO220
760 PRINT"Numbner of disks is"DN". Enter new number, but BE CARE
FUL!"
780 INPUTX$:X=VAL(X$):IFX<0ORX>32767THEN220
800 DN=X:GOTO220
820 CLOSE:OPEN"O",1,"TRANSFER/DAT"
840 PRINT#1,VI","D2","D2$","DN","IN","KT$
860 CLOSE
880 RUN"MAGIDEX"
900 RUN"MAGIDEX"
```

Program Listing 7

```
B000            00100          ORG     0B000H
000D            00110 CR       EQU     13              ;carriage return
B000            00120          TITLE   '<Magidex Loader Program>'
B000            00130          COM     '<Copyright (C) 1982 by C.P.Knight>'
B000            00140          COM     '<ALL rights reserved!>'
000A            00150 LF       EQU     10              ;linefeed
0003            00160 ETX      EQU     3               ;end of line
008F            00170 GB       EQU     143             ;graphics block
B000 4C         00180 BUFFER   DB      'LBASIC RUN"MAGIDEX"',CR        ;filspec
     42 41 53 49 43 20 52 55
     4E 22 4D 41 47 49 44 45
     58 22 0D
B014 2100B0     00190 START    LD      HL,BUFFER
B017 C30544     00200          JP      4405H
B01A 1C         00210 SIGNON   DB      28,31
     1F
B01C BF         00220          DB      191,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,G
B,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F
B03C 8F         00230          DB      GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB
,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,191
     8F 8F 8F 8F 8F 8F 8F 8F
```

Listing 7 continues

Listing 7 continued

```
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F BF
B05C BF         00240          DB      191,'  Now loading LBASIC/CMD and running MA
GIDEX automatically!   ',191
     20 20 4E 6F 77 20 6C 6F
     61 64 69 6E 67 20 4C 42
     41 53 49 43 2F 43 4D 44
     20 61 6E 64 20 72 75 6E
     6E 69 6E 67 20 4D 41 47
     49 44 45 58 20 61 75 74
     6F 6D 61 74 69 63 61 6C
     6C 79 21 20 20 20 BF
B09C BF         00250          DB      191,'        You are about to experience the
 ultimate in           ',191
     20 20 20 20 20 20 20 20
     59 6F 75 20 61 72 65 20
     61 62 6F 75 74 20 74 6F
     20 65 78 70 65 72 69 65
     6E 63 65 20 74 68 65 20
     75 6C 74 69 6D 61 74 65
     20 69 6E 20 20 20 20 20
     20 20 20 20 20 20 BF
B0DC BF         00260          DB      191,'    TRS-80 disk catalogue information s
torage - retreival     ',191
     20 20 20 20 54 52 53 2D
     38 30 20 64 69 73 6B 20
     63 61 74 61 6C 6F 67 75
     65 20 69 6E 66 6F 72 6D
     61 74 69 6F 6E 20 73 74
     6F 72 61 67 65 20 2D 20
     72 65 74 72 65 69 76 61
     6C 20 20 20 20 20 BF
B11C BF         00270          DB      191,'         Program Copyright (C) 1982 by
Charles P. Knight      ',191
     20 20 20 20 20 20 20 20
     20 50 72 6F 67 72 61 6D
     20 43 6F 70 79 72 69 67
     68 74 20 28 43 29 20 31
     39 38 32 20 62 79 20 43
     68 61 72 6C 65 73 20 50
     2E 20 4B 6E 69 67 68 74
     20 20 20 20 20 20 BF
B15C BF         00280          DB      191,'                     All Rights Reserve
d.                     ',191
     20 20 20 20 20 20 20 20
     20 20 20 20 20 20 20 20
     20 20 20 20 20 41 6C 6C
     20 52 69 67 68 74 73 20
     52 65 73 65 72 76 65 64
     2E 20 20 20 20 20 20 20
     20 20 20 20 20 20 20 20
     20 20 20 20 20 20 BF
B19C 8F         00290          DB      GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB
,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F
B1BC 8F         00300          DB      GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB
,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB,GB
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F 8F
     8F 8F 8F 8F 8F 8F 8F
B1DC 03         00310          DB      ETX
                00320 BEGIN
B1DD 211AB0     00330          LD      HL,SIGNON
B1E0 CD6744     00340          CALL    4467H
B1E3 C314B0     00350          JP      START
B1DD            00360          END     BEGIN
```

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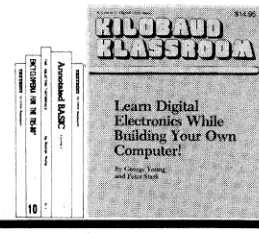

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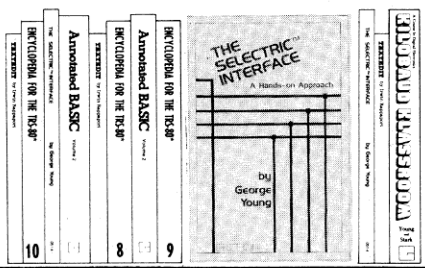

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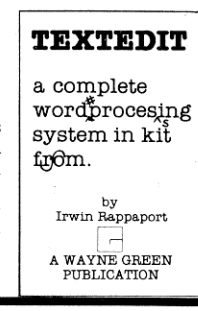

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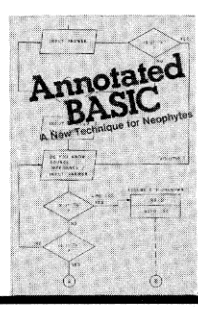

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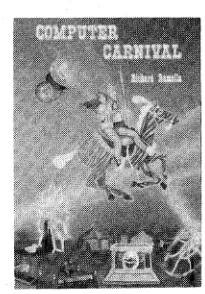

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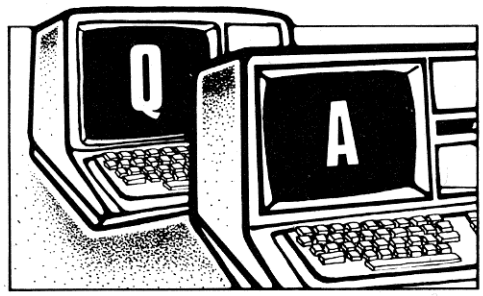

Problems and solutions

Concerning the problem of expanding RAM in the TRS-80 computer, three vendors in your magazine advertise RAM expansion to 64K RAM, Omikron, Memory Merchant, and Freedom Technology International. Are you saying that these products don't work? Or that they don't provide 64K of usable RAM?

I am now using the Omikron Mapper I and am tempted to update it to the extra 16K RAM, except that you and everyone else states that it can't be done.

C.H.
Wheaton, IL
J.R.
Sherman Oaks, CA

That's not exactly what I meant. The Z80 CPU (or any other processor with a 16-bit address line) can access only 64K bytes of memory, either RAM, ROM, or a mixture of the two. The TRS-80 is designed with a 12K ROM that contains Basic, the TRS-80 operating system, and 48K RAM of user memory (there's an additional 1K of RAM for video memory, and a bank of 2K addresses that aren't used, plus a few miscellaneous bytes used for system overhead). This means that whenever a machine-language program, such as VisiCalc, is used, the memory positions occupied by the Basic ROM aren't used.

The Omikron Mappers I and II and other 64K modifications reconfigure the TRS-80 to turn off the ROMs and use their own operating system software and hardware. When you use the Mapper I, the 48K of memory used is the standard memory in your computer and your ROMs are ignored. Putting in the extra 16K of RAM replaces the ROM, as far as the Mappers are concerned, giving you a total of 64K of RAM. The Z80 isn't addressing more than 64K of memory, it's just accessing the lower 16K bank of RAM in the Mapper I instead of ignoring the 12K of ROM on the TRS-80 main circuit board. This translates into more user space for you since your computer is no longer wasting the lower 16K bank of addresses as unusable ROM.

How does one become an independent repair technician for modified Radio Shack computers?

J.C.
Los Angeles, CA

First, learn enough electronics to work on sophisticated equipment without destroying it; second, get the schematics and technical manuals for the TRS-80 computers so you'll know where things are and what they're supposed to be doing; and third, advertise your availability as a service technician.

If you want to get a job with Radio Shack, either at a Computer Center or at an independent dealer store, you have to provide Tandy with a resume stating what electronics school you graduated from, or what your qualifications are as an electronics technician (what companies you've worked for, how long you've been doing it, etc.), as well as a letter declaring that you'll abide by their rules and regulations regarding the proprietary secrets of their products, and that you will not sell repair parts without installing them yourself.

If you succeed in convincing Tandy that you're an honest person and know what you're doing, they'll send you to a training seminar in Fort Worth to certify you for repairing their equipment.

Other than that you're on your own. If you don't know anything about electronics, enroll in a local technical school course that provides you with hands-on experience.

I have a 48K Model I (with buffered cable and twisted-pair Expansion Interface "fixes," and the new two-chip ROMs with two MPI disk drives. The system refuses to CLOAD in Disk Basic. I have tried to CLOAD Basic programs using four different DOSes without success. System tapes load trouble-free. Basic programs CLOAD perfectly in Level II Basic. I understand the CMD"T" and CMD"R" commands, but they seem to have no effect. After a CMD"T" and CLOAD, the recorder turns on and the system locks up.

D.S.
Austin, TX

That's a toughy! Your problem is probably a bad RAM bit (or series of bits). If there was a problem with the ROM chips, then you wouldn't be able to CLOAD under either Level II or Disk Basic. It can't be the cassette port of the CPU for the same reason. Since the Expansion Interface isn't used for cassette I/O, either for circuitry or for machine-language code, the buffered cable and fixes are likewise removed from the list of suspects. Similarly, when loading a tape program, DOS lets the ROMs do all the work. This leaves only the RAM in the keyboard unit. I suggest that you run a RAM-check program to see if you can trap the problem chip. If the unit fails the test, you've found your problem. If it doesn't fail, take the unit (CPU and Expansion Interface) to your local computer center and have a technician examine it.

The only other choice you have is to use MULTIDOS (Cosmopolitan Electronics Corp., P.O. Box 89, Plymouth, MI 48170, $99.95), which has a special DOS command that drops into Level II completely. After loading your program in a normal Level II environment, you reset the computer and go back into Disk Basic, where you'll find your program waiting.

I have a Model I, Line Printer VII, and the Printer Interface Cable (26-1411). I recently purchased the bus-decoding version of the Microconnection (Microperipheral Corp.)

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My problem is that I can't operate the modem and the printer simultaneously. I could plug the printer to the modem's port on the rear except that the LP VII is set to 600-baud operation. How can I add other peripherals that plug into the expansion (Exatron's Stringy Floppy, joysticks and so forth) and have them all on-line?

D.A.
Smithfield, VA

That's an easy one. Alpha Products (79–04 Jamaica Ave., Woodhaven, NY 11421, (212) 296-5916) makes a series of cables called Expandabus that lets you plug several devices to the expansion port simultaneously. The two-device cable is $29, the three-device cable is $44; the four-device cable is $59; and the five-device cable is $74.

Since different devices use different ports for their I/O, you should have no problem connecting your peripherals to the expansion bus and eliminating the need to plug and unplug cables each time you want to use a different peripheral.

I have a Model I and I want to connect a large video monitor to use in my high-school class. The TRS-80 uses two wires and a ground to go to the video display, and the monitor I have needs only one wire and a ground. What do I do?

B.H.
New Rochelle, NY

First, a little background: The monitor used on the Model I is a modified TV set. To make the video as inexpensive as possible, Radio Shack used what is known as a hot-chassis TV. The ground on the TV is isolated from the wall-current ground, and can range as much as 30 volts over the normal zero-volt ground. The computer uses a "true" ground. Obviously, to just connect these two together would be disastrous. To get around this problem Radio Shack uses an optical-isolator inside the monitor to separate the computer signals from the video signals. To ensure the separation, the optical-isolator is powered by the computer, not the TV. If you examine the technical manual on the Model I, you'll discover that the three lines to your video are labeled video, 5-Volt, and ground. Since a normal monitor only needs the video and ground lines, connecting the TRS-80 to it is easy, just ignore the 5-Volt and connect the other two lines to your monitor.

One word of caution, before beginning to operate on your Model I, make sure that the monitor you have is not a hot-chassis. If you don't know, take the unit to a TV technician and have it checked out. For more detailed instructions on how to modify your computer, see pages 96–98 of *The Custom TRS-80* by Dennis Kitsz (IJG Inc., 1260 West Foothill Blvd., Upland, CA 91786, (714) 946-5805).

This letter is to acknowledge the receipt of a #GN42G green phosphor CRT for my Model I, as advertised by Langley-St. Clair Instrumentation Systems (132 West 24th St., NY, NY 10001) in the September issue of 80 Micro. *Since I ordered the CRT by phone only four days ago, the service is remarkably prompt considering that the majority of suppliers are known for their slow service. Although the instructions contained no diagrams, they are in plain English and I was able to install the new CRT in about 20 minutes.*

The difference in the quality of the display is most gratifying; it has a much more "professional" appearance to it. The contrast is much better and it's easier to use for sustained periods of time.

The question I have regards the Model III. I'm thinking of getting one and I want to know if the #GN42G green CRT can be transferred from my Model I to the Model III.

J.K.R.
Columbus, OH

Yes it can. Langley-St. Clair is sending you the instructions on how to do it.

Is there a company that makes a light pen for the standard Color Computer? If not, what would it take to modify the light pen for the Model I or III for use with a Color Computer?

D.C.
Mobile, AL

Spectrum Projects (93-15 86th Drive, Woodhaven, NY 11421, (212) 441-2807) sells a light pen for the Color Computer. It connects to your joystick port and works with both Color Basic and Extended Basic. It retails for $14.95.

As for converting a light pen from the Model I or III to the Color Computer, it depends on how the individual light pen is constructed.

I have a Model I, Level II with a 48K RAM, Expansion Interface, three disk drives, and a Line Printer VI, all from Radio Shack.

When I use Radio Shack's Inventory Control System, the forms do not advance properly. When a page is printed, the printer advances to the next page, but instead of stopping at the same place on the new page it goes too far by one line. By the time I have printed several pages, the printer is printing on the page perforations. Can you suggest a fix?

S.G.
Miami, FL

What you want to do is check memory location 4028 (PRINT PEEK (16424)) and see what value is stored there. This should be the number of lines per page. Since you're experiencing problems with one line feed too many, use the POKE command to reduce this number by one (POKE 16424, PEEK(16424) – 1). It should now form-feed one line less than before and stop exactly where you want it to stop.

I have a standard 48K, two-disk-drive Model III, and I want to add two external drives to it. Can I use double-headed drives with my system and DOSPLUS 3.4? I would like to add one 40-track and one 80-track double-headed drive, or would it be better to use two 40-track DH drives for compatibility?

Also, will I be able to run Radio Shack's Profile program after converting it to DOSPLUS on this system? And will it be able to take advantage of the increased available space?

H.C.A.
Seattle, WA

DOSPLUS will let you use any combination of single and double-headed drives on your computer, up to the limit of four drives. Rather than add one 40-track and one 80-track, why don't you just get two 80-track double-headed drives? After all, you already have two 40-track drives in your main computer case. Don't be worried about swapping the disks from drives 1 and 2 to drives 3

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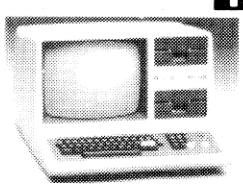

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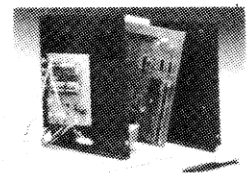

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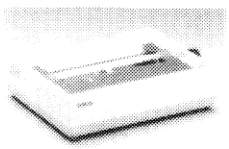

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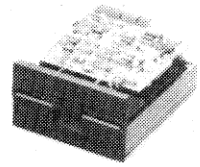

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and 4, you can use the Skip command to make the 80-track drives read the 40-track drives (but don't try to write on the 40-track disks with the 80-track drives). The October Feedback Loop column and a letter further on in this column provide more information on this subject.

How can I make a disk with track 0, sector 0 in single density and track 0, sector 1 in double density?

R.K.
Fallston, MD

Kim Watt, author of Super Utility and programmer for Powersoft (11500 Stemmons Fwy., Suite 125, Dallas, TX 75229, (214) 484-9428), is the only one I know who has solved this problem, and he's not telling his secret. Instead, he's selling a master disk to software producers that creates distribution disks with track 0 formatted in both single and double density.

My Micromatic printer system, which uses the IBM 1980 terminal with the Micromatic Interface, has started to print F instead of B. Local technicians found one of the two PROMs in the interface to be working improperly, but can't fix it because they don't have the correct PROM program.

Unfortunately, my telegrams to the Micromatic Corporation were returned and their telephone number has been disconnected. Please help!

W.P.
Agana, Guam

I can't find anything about them, can anyone else help?

I own a 16K computer with Color Basic 1.0 that has been upgraded from 4K. When I replaced the keyboard after installing the RAM, the H and O letters didn't work. I checked the keyboard connection and it seemed OK. When I tried the keyboard again, it worked. What happened?

Also, my computer will occasionally turn itself off while I'm using it. What could cause this? And do you know where I can get schematics for my computer?

Finally, the numbers on the bottom of my PC board are 8709137-D and 1018543. What version does that make my computer?

R.R.
Kanona, NY

Your problem after installing the RAM was a loose keyboard connection, as you thought. By reopening the unit and pushing the keyboard around you pushed the keyboard into better alignment, curing the complaint.

Your computer turns itself off because you have a sudden-death power supply! Some power supplies are poorly soldered and as the computer gets warm, the parts sometimes break contact, killing the power to the computer for a millisecond or so. This is just long enough to pull in the protection circuitry, which turns off the computer to prevent damage. The solution is to take a soldering iron and gently reflow the solder of the parts of the power supply, especially around the resistors.

Schematics of the Color Computer are available from Radio Shack in the *Color Computer Technical Manual* (#26-3193, $14.95).

You have the version D board. The latest version is the E board.

I am 13 and in 8th grade. I am also hooked on Basic programming and can't wait to get my own Model III. I have heard that a Japanese company is making a computer that uses English for programming (i.e., 10 PRINT THE SUM OF 2 & 3). I'm worried that Basic will become obsolete in a few years. Is this true?

R.W.
New York, NY

Yes, computers using English are being developed, and by several companies. The difficulty with programming in English is that English requires so many words to construct commands (compare your example with 10 PRINT 2+3) that a good portion of memory and time is used in decoding the command. As processors speed up, can address more memory, and the cost of memory drops, these problems will become trivial. The only problem left is inertia in the marketplace. There are approximately 2 million microcomputers in private hands now, and almost all use a dialect of Basic. Also, the ability to program is based more on experience than on the language used. Someone who has been programming Fortran for 10 years obviously has an advantage in logical thinking and problem-solving techniques than a beginner in Basic.

I don't think you need to worry about the English-programming computers replacing Basic computers; besides, if they do, you'll find it much easier to write your programs since Basic is based on simple English commands.

My problem is with my RS Tandon TM-100 disk drive on my Model I. When trying to back up a disk using NEWDOS80, the screen says "Motor Speed Too Slow." With NEWDOS Plus it says to try the Format command, which in turn responds with "Can't Format." What's up?

T.R.
Weslaco, TX

It sounds like your disk drive needs to be checked out. You have two choices: Take the drive to RS and have them look at it, or buy a disk-drive test program such as the DiscoTech (Microcomputer Products, P.O. Box 11129, Santa Rosa, CA 95406, $29.95) or the Floppy Doctor (The Micro Clinic, 17375 Brookhurst #114, Fountain Valley, CA 92708, $29.95).

Either of these programs will tell you if your disk drives are running at the correct speed. Floppy Doctor includes an extensive disk diagnostic that will also check your drive's head alignment, write sense switch activity, track-to-track read/write interference, track-to-track switching accuracy, and several other functions. Once the problem has been located as being either software or hardware, you can take the appropriate corrective action.

The letter from D.T. about blowing a fuse in the Expansion Interface power supply and the subsequent erratic operation are close to what happened to my Model I. Here's what I found:

- *The fuse in the power supply can be replaced by cutting open the case, unsoldering the blown fuse, soldering two clipped-off leads from a resistor onto the endcaps of a new fuse of the same power rating, soldering the new fuse back into the power supply, and taping the case back together. This saves money and time over getting a replacement power supply when the problem is only a blown fuse.*
- *The intermittent and erratic operation of the disk drives was due to the Expansion Interface being turned on and off due to a broken lead of the power rectifier, MDA202. MDA202 is mounted flush on the board with the*

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leads soldered to the foil on the other side of the circuit board. One lead had crystallized and broken right where the lead goes into the plastic case of the rectifier, making it almost impossible to discover by visual inspection.

Subject to temperature changes and vibrations, the lead would either make the connection and allow power to the Expansion Interface, or break the connection and stop power. Every time the Expansion Interface was turned on, it sent a signal to the disk drives to start, as they do whenever the computer is turned on normally. However, in this case the main CPU remained on while the Expansion Interface turned on and off, causing all kinds of havoc with the programs and disks.

● *In my case, the resultant shocks and constant on/off cycles killed my disk controller, the FD1771B chip.*

Since I replaced the FD1771B chip and the bad rectifier, everything has worked fine, with one exception. I managed to break the ribbon cable connecting the CPU board to the keyboard, but repaired it by using leftover wire from my Archbold Speedup kit.

This problem would have been expensive for a shop to repair, especially with all the modifications my computer has and the near invisible broken lead. I found the culprit by hooking up my voltmeter to the various power-supply components and flexing them by hand while watching the voltmeter readings.

J.E.G.
Newark, DE

Before you go sawing into your power supply to replace a blown fuse, check the catalog number on the bottom of the unit. If the catalog number is 400007, remove the rubber feet and unscrew the four bolts holding the unit together, then replace the fuse and reassemble the power supply. If, on the other hand, the catalog number is 400004, you will have to saw the unit apart to get at the fuse.

About the broken lead, that's the hard way to find a problem. Unfortunately, there isn't an easy way either. I have a similar problem. One of the chips on my CPU board is pulling the 12-volt line down to 8 volts. Everything works fine until I try to plug in my Holmes Engineering 5-MHz speedup kit (the Sprinter II). Whenever I type A = 1 and press enter, I get a syntax error. All other math operations similarly fail. One of these days I'll tear into the CPU and find that chip, but as long as it works without the speedup kit plugged in, I'm not in a real hurry.

I'm a part-time consultant, and I've leased a Model III and Daisy Wheel printer in my business name for home use. I can't get the insurance company that carries my homeowner's policy (or any other insurance company, for that matter) to cover the equipment. It seems the premiums on $5,000 aren't worth the insurance company's time and effort.

Are there any insurance companies that specialize in writing these kinds of policies?

J.M.
Los Angeles, CA

Personal computers are usually included with the contents coverage of a homeowner's policy, as long as the monetary coverage you have is sufficient to include the computer in that coverage. For example, if you have contents coverage of $25,000 and the contents of the house are valued at $24,000 and you buy a $5,000 computer, then your coverage will be short by $4,000. You should always make sure that the insurance contents coverage of your homeowner's policy more than covers the actual cash value of the contents of your home.

This is the category most home computers fall into, myself included. Since I don't have an office and I don't have clients coming to my house (even though I have a room dedicated to my computer stuff) my policy's coverage includes the $10,000 I have in computers, peripherals, and software.

Unfortunately for you, by putting your computer in your business's name, you've automatically made it ineligible for standard contents coverage (all homeowner's policies exclude equipment owned by a business from their coverage, figuring that the business has a separate policy to cover its equipment).

There are two ways for you to get coverage for your equipment. The first is Inland Marine Coverage, which is used to insure items kept at home that are owned by a business (for example, a carpenter's tools are owned by a business, but the carpenter keeps them at home). This type of coverage is usually available with a minimum premium of about $50–$100.

The other choice you have is called an Office Endorsement policy. If you have an office in your home where you receive customers or appointments, you need the Office Endorsement policy added to your homeowner's policy. This policy requires that you increase your homeowner's contents policy coverage to specifically include the equipment you use.

For more information on these policies, you'll have to contact your insurance agent.

My thanks for your response (January 1983). Since then I have been experimenting and found that the software works well with only a few minor inconveniences if the Epson is initialized to standard-size characters instead of compressed. The following lines accomplish this, and return to TRSDOS:

```
10 LPRINT CHR$(27) CHR$(18)"A"
CHR$(140);
20 CMD "S"
```

I have a Model II and use mostly menu programs. Since 80 Micro *prints many interesting programs for the Model I and III computers, I'm looking for some translation instructions that will enable me to convert these programs to run on my Model II. I'm certain that something like this must have been done long ago and perhaps has been printed in an earlier issue. I use TRSDOS 2.0A and CP/M 2.25-C.*

S.R.
Palatine, IL

Well, there is a partial solution in the offering: *80 Micro* will soon be publishing Model II conversions of selected Model I/III articles. Other than that you're on your own. Fortunately, most of the Model I/III Basic commands are duplicated on the Model II. The only commands that cause a problem for conversions are PEEK and POKE, neither of which is available in TRSDOS Model II Basic.

If you buy the *TRS-80 Microcomputer Newsletter Reprints* (catalog #26-2115, $4.95) you will find a comparison chart of the Basic commands of the Model I, II, and III computers, so you will be able to look up which commands aren't compatible between the three computers. You will also find a conversion chart for translating the

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Print@ video positions between the Model I/III and the Model II.

I have a Model III 48K with an 80-track Percom drive and controller. Is there a DOS that will format 35- to 80-tracks in single- or double-density on an 80-track drive so I can copy files to them for compatibility with other systems?

G.R.
Fairport, NY

Yes, but there's a problem you should watch out for: The 35-track drive heads write a magnetic path twice as wide as an 80-track drive head. If you have a 35-track disk formatted by an 80-track drive, it can be read by either an 80- or 35-track drive. It can be written to by either drive type.

The problem comes when you try to read the disk directory in the 35-track drive after it has been written to by *both* the 35- and 80-track drives. When writing to the disk in the 35-track drive, you lay down a double-width magnetic path (any write operation causes the DOS to update the directory, laying down the wider path there also). This is easily read by the 80-track drive. But when the 80-track drive writes to the directory, it writes on only *half* the path put there by the 35-track drive. Now, when you put the disk in the 35-track drive, it sees not only the new information put there by the 80-track drive, but also the leftover information from the previous 35-track write operation. Since the drive head can't tell the two signals apart, you get garbage. But the 80-track drive will still be able to read the track properly.

This is only a problem when you're performing multiple read and write operations to a 35- or 40-track disk in an 80-track drive.

MULTIDOS is easily capable of formatting 35- or 40-track disks on an 80-track drive, in either single or double density. The data disks used for this can easily be read by any DOS on the market, except NEWDOS, TRSDOS, and ULTRADOS. In fact, if the other DOS is LDOS, you can easily swap the data disks between LDOS and MULTIDOS. DOSPLUS can also read and write 35-track disks on 80-track drives, but requires the use of a convert utility to transfer Model I data disks into Model III data disks.

I suggest you get MULTIDOS (Cosmopolitan Electronics Corp., P.O. Box 89, Plymouth, MI 48170). At $99.95 it's the best DOS available.

You can also use Super Utility Plus (see Feedback Loop in December 1982 issue) to format and copy to 40-track disks in an 80-track drive.

I need the service manual for Model I disk drives. I think the repair charges are out of step since it's so easy to adjust the stepping relay and align the head, yet I hesitate to do anything without a service manual.

F.H.
Flint, MI

You can buy the service manual (catalog #26-1160) for Model I disk drives from National Parts (817) 870-5662 for $3.03 and $1.50 shipping and handling. Before digging into your drives, I suggest that you get a disk diagnostic program like Floppy Doctor or DDT.

"The 35-track drive heads write a magnetic path twice as wide as an 80-track drive head."

I have a Model I with 48K and one disk drive. I use NEWDOS80 2.0, and TRSDOS 2.3. Under DOS the system works fine, but when I try to use Basic nothing works. Under NEWDOS80, Basic loads and the ready prompt appears, but when I try to load a program the trouble starts. When I press the letter O, I get an L followed by a question mark, a graphic symbol, and then the word error. This happens each time I type L until the system locks up. Rebooting repeats the experience or the system goes into the 32-character mode and locks up.

TRSDOS won't even go into Basic. Instead, it goes into a repeating process of going into Basic, rebooting, going into Basic, rebooting, and so on.

The TRSDOS TEST1A/CMD tells me the ROMs are fine, but all the interface RAMs are bad. Using the memory test program published in 80 Micro *(March 1980), the interface RAM checks out OK.*

Your help is greatly appreciated.

L.W.
Brookfield, WI

The first thing I would do is disconnect the keyboard/Expansion Interface cable and use Q-Tips and isopropyl alcohol to clean the edge connectors of both the Expansion Interface and CPU boards (both sides, top and bottom). Then remove your disk-drive cable and clean its edge connectors on the interface board and inside the disk drive cabinet. Finally get the Floppy Doctor (see previous letter in this column) and use it to check out your disk drives and your system's RAM. Cleaning the edge connectors cures about 90 percent of the memory problems in the Model I. Since one memory test said all the Expansion Interface RAM was bad and another didn't, I suspect that the cable was fouling things up. Not all memory tests are equal. The M1-Worm Test is one of the better tests, taking hours to thoroughly test the RAM.

If, after cleaning the connectors, you still have the same problem, I suspect that the disk-drive interface circuitry is malfunctioning, especially since two different DOSes have the same problem on your system. This means you'll have to take the system in for repairs at your local Radio Shack Computer Center. ■

Terry Kepner is a free-lance writer and programmer, and the vice president of Interpro. He's been writing about microcomputers since 1979.

Update

In the December issue of Feedback Loop, I said that *80 Micro* had more ads and articles about the Color Computer than either *The Rainbow* or *Color Computer News* magazines. At the time that it was written (approximately August/September) it was a true statement.

However, the microcomputer industry changes so rapidly that by the time this statement appeared, it was outdated. The latest issue of *The Rainbow* (my October 1982 issue) contained about 90 advertisers, and was 130 pages thick. *Color Computer News* has had a similar growth.

If you're looking for products and information on the Color Computer, check out these two magazines.—Terry

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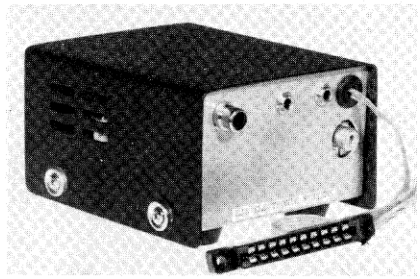

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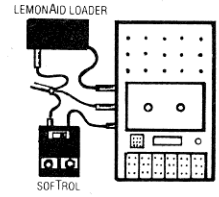

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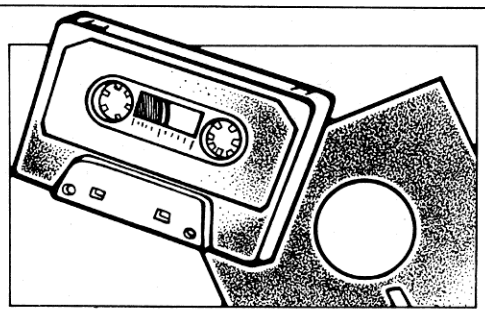

Fine points of tape loading

Less than 1 percent of the Load 80 tapes we send out come back as unloadable, but that's small consolation if you get one of those tapes. It's one of the most frustrating experiences—the bytes holding your favorite game are there on the tape, but might as well be locked in a bank vault. Here are a few keys to help you unlock those difficult tapes. This information is applicable to Load 80 for the Model I/III and Color Computer.

First let's consider the areas in which difficulty might occur:

- Something is wrong with the computer circuit that reads tapes.
- Something is wrong with the tape recorder.
- Something is wrong with your technique in loading the tapes.
- Something is wrong with the tape.

The problem can be a combination of things. For instance, your tape recorder can be in marginal condition, but still be able to load most tapes. When you attempt to load a flaky tape, however, it will fail. Your aim should be to optimize all four of the above conditions for easy tape loading.

The program NODOS80 from the Anniversary Issue did not appear in the Load 80 directory but is included on the cassette. Since this is a tape utility, it is not included on the disk. This special Load 80 tape is expanded to 40 minutes instead of the usual 30. ■

Table 1 is a partial list of manufacturers who supply products to ease loading difficulties.

Hardware Modifications To the Loading Circuit

Radio Shack improved the cassette port on newer Model Is, the Model III and the Color Computer, but the early Model I cassette port was dismal. In many cases good-quality tapes will not load, or will load only in a narrow volume range.

If your machine prints MEM SIZE? instead of MEMORY SIZE? it is one of the newer machines and has a modified cassette port for easy loading. This is the XRX III modification, and for years the Shack offered it as a free upgrade to older machines. Today there is a $15 service charge, but the cost is easily worth it.

One note: The XRX III modification creates a window at 500 baud, so it will not read files created by high-speed tape loaders like KWICOS from Kwik Software or Rapid System Loader (April 1982, *80 Micro*, page 188).

Another way to improve poor loads is to filter the signal coming from the tape recorder. Devices like the Acu-Data from Alphanetics or the Lemon-Aid Loader from Lemons Tech Services improve the quality of the tape signal before it reaches the keyboard. These devices are indispensable for loading Model I/III tapes at 500 baud.

The LM339 chip on the earliest Color Computers has a distressing tendency to blow up when loading a tape at high volume. When the chip blows up the

Program	Title	Page	Comments
1	COPYRGHT/BAS	—	None
2	NIGHTSHD/BAS	85	None
3	DEEPDIVE/BAS	96	None
4	SUPRDRAW/BAS	108	None
5	TURTLE/BAS	116	None
6	BOXER/SRC	134	Needs EDTASM
7	FLAGS/BAS	149	None
8	CASS80/BAS	152	None
9	MATHCDWN/BAS	160	None
10	PRESKOOL/BAS *	184	None
11	PRESKOOL/SRC *	184	Needs EDTASM
12	PROGGEN/BAS	296	None

* Disk versions for disk, cassette versions for cassette. Remark statements in source code listing are deleted to make room for this program on Load 80, and to enable Assembly in a 16K cassette-based machine. Cassette versions are modified to run in 16K.

February Load 80 Directory

Tape Digitizers

Acu-Data
Alphanetics
Box 597
Forestville, CA 95436
$49.95

Eazy Loader
Progressive Electronics
643 E. Chestnut St.
Lancaster, OH 43130
External: $24.95
Internal: $12.50

LemonAid Loader
Lemons Tech
325 N. Highway 65
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Buffalo, MO 65622
$14.99–$21.99

Head Alignment (Azimuth) Tapes

Recordex Corporation
1935 Delk Industrial Boulevard
Marietta, GA 30067
$25 (specify Azimuth tape)

Most major tape manufacturers (TDK, Maxell, etc.). Check with your local hi-fi store.

Tape Head Demagnetizer

Radio Shack part #44631
$5.95

Table 1. Products to Improve Tape Loading

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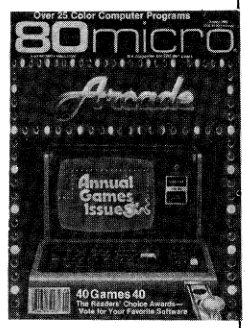

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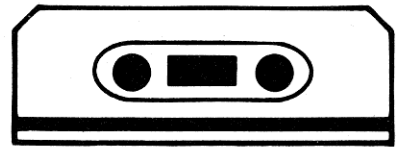

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machine will be totally deaf. The LM339N chip (Radio Shack part #AMX4319, $6) corrects this problem.

Correcting Your Recorder's Head Alignment

The tape recorder has an extremely difficult job—it must store data on an audio tape with sufficient fidelity for the routines in ROM to convert it back to bits and bytes. In the recording and playback process a fair bit of electronic noise is added to the signal. It's clear then that we must keep the recorder in top operating condition to have a fighting chance.

If you press the play button on your tape recorder without a tape in the machine, you will see three components come out. From left to right, they are a tape guide, which guides the tape on its way, the playback head, which does the actual reading and writing of the tape, and the pinch roller, which pinches the tape against a small metal prong called the capstan.

The single most important factor in loading tapes is the alignment of the playback head. If the alignment (also called the azimuth) of the recorder is different from the alignment of the tape, the signal will lose the important higher frequencies and cause extremely poor loading.

Correct head alignment is relative only to the alignment of the recorder that recorded the tape. In other words, if your head alignment is off and you record a tape, you will be able to read it, but will not be able to load a tape produced on your friend's brand-new CTR-80. In our experience, head alignment varies widely on recorders used both in the home and in the computing profession. The best we can do is align our equipment to factory specifications.

The CTR-80 permits access to the head alignment screw through a tiny hole in the faceplate, but some recorders require that you drill a small hole. You will need a drill with a small bit (about 3/16").

- Press play with no cassette in place. The playback head will come out to meet the cassette.
- If you look closely you will see a small Phillips screw about 1 millimeter behind the playback head, on the side of the head nearest the tape guide. This is the head alignment screw. On most recorders it is directly in line with the play button.
- Drill a small hole directly over this screw. Be careful not to damage the head mechanism.

You will need a small Phillips screwdriver to do the actual alignment. You can use a professional alignment cassette or you can align to individual cassettes. We recommend the latter.

- Insert the cassette and fast-forward to the middle of a program. Press play and turn the volume up about halfway.
- Use the small Phillips screwdriver to adjust the head alignment screw. Turn the screw until the sound is brightest and the pitch seems highest.
- The tape and your recorder should now be in the same alignment.

A Shack Mod and Maintaining Your Recorder

The playback heads on early CTR-80 recorders have a distressing tendency to erase tapes. A field collapse occurs when you press stop during a load, erasing the bytes currently on the tape head. For years Radio Shack installed (for free!) a capacitor to clear up this problem. Today it will cost you the $15 service charge but is well worth it.

To determine if your recorder needs this modification, remove the cover to the battery compartment. If the inspection sticker is marked earlier than 4A9 (April 1979) you need this modification.

Your recorder also requires periodic cleaning to stay in peak condition. Clean the playback head regularly with a cotton swab and isopropyl alcohol (not acetone) to prevent tarnishing. This alcohol can be purchased at a local drugstore. Simply ask for 97 percent rubbing alcohol with no dye or perfume additives.

The pinch roller and capstan pick up a varnish from the tape which prevents them from gripping the tape effectively. A cotton swab and isopropyl alcohol or acetone is in order here.

The playback head becomes magnetized after repeated use and will erase bits and bytes from the tape oxide. Monthly use of a tape demagnetizer (Radio Shack part #44631) will prevent this.

Next month we will go over the two remaining areas of difficulty: user skill and tape problems. ■

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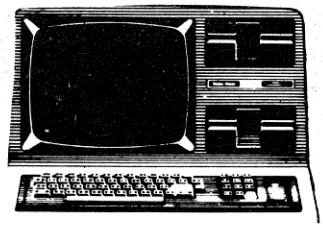

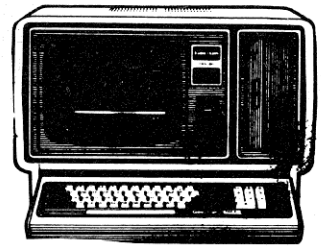

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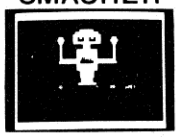

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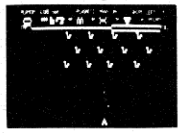

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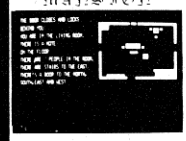

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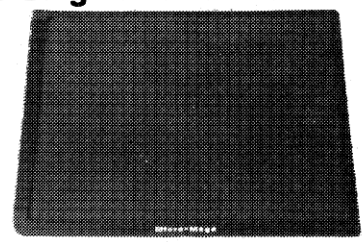


The eye-pleasing Green-Screen fits over the front of your TRS-80 Video Display and gives you improved contrast with reduced glare. You get bright luminous green characters and graphics like those featured by more expensive CRT units.

Don't confuse the Original Green-Screen with a piece of thin film stuck to the face of your video tube, such as that advertised by others. The Original Green-Screen is mounted in a full frame perfectly matched to the color and texture of the TRS-80 Video Display. It is attached with adhesive strips which do not mar your unit in any way.

The full frame design of the Original Green-Screen "squares off" the face of your video display and greatly improves the overall appearance of your system.

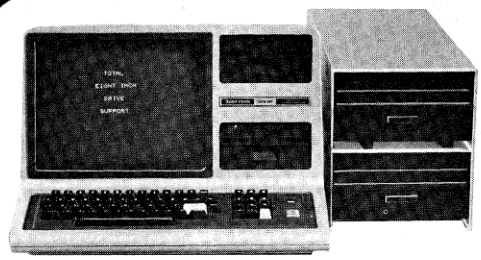
(Specify whether for Model I or Model III)

THE GREEN-SCREEN.....*$13.95*

Add $1.50 for postage and handling.

Terms: Check or money order, no CODs or credit cards, please. Add amount shown for postage and handling to price of the item. All items shipped within 48 hours by first class or priority mail. Virginia residents, add 4% sales tax. ✓162

Micro-Mega · P.O. Box 6265 · Arlington, Va 22206



We've done it again!

We said we had the best system, and now... 8" double density is here for Model III's.

Check out these Features -

✓568K of storage on a single-sided 8 inch drive, when used with our controller & speedup MOD. ✓The maximum storage capacity of your Model 3 will be 4.544 Megabytes - without a hard disk. ✓One 5¼ single-sided and one 8 inch single-sided drive will store 676K. ✓One 5¼ single-sided and one 8 inch double-sided drive will store 1.244 Megabytes. ✓Mix and match 5¼ and 8 inch drives, in any density, single or double-sided. All under software control.

1. Speedup **$99.00**. 2. General purpose speedup, which also works with 8 inch drives **$129.00**.

Here's 3 good reasons to buy our system -

1. VERSATILITY

Our own proven, dependable drive controller will give you the hardware to run almost any drive configuration you can imagine/

- 5¼ and 8 inch drives in any combination.
- Internal/external drive combinations (Up to all 4 drives external).
- **Single - and dual - headed drive combinations.**

2. QUALITY

- We use quality drives - MPI and now new generation Siemens.
- We construct our own disk drive installation kits of heavy steel - no shielding Problems!
- We are now using a field proven switching supply.

3. PRICE

- Drive controller kit with **first** drive, **16K MEM, TRSDOS 1.3*** **$679**
- Second (internal drive) **$279**
- Third drive (5¼ flippy with cable) **$359**
- Fourth drive (5¼ flippy) **$329**

If these sound like good deals, but you don't have the Model III yet, we've got the answer.
TRS-80 Model III, 48K TRSDOS*, 2 drives $1899

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master charge VISA ✓288

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✓See List of Advertisers on Page 387

NEW PRODUCTS

edited by Eric Grevstad

A More Powerful Vocabulary

The Votrax Personal Speech System is a voice synthesizer that uses a highly articulate text-to-speech translator, achieving a translation accuracy rate of at least 95 percent for conversational vocabulary. It also has a programmable master clock, 350 programmable frequencies for speech and sound effects, and a built-in speaker, and can simultaneously provide speech and sound effects or speech and music.

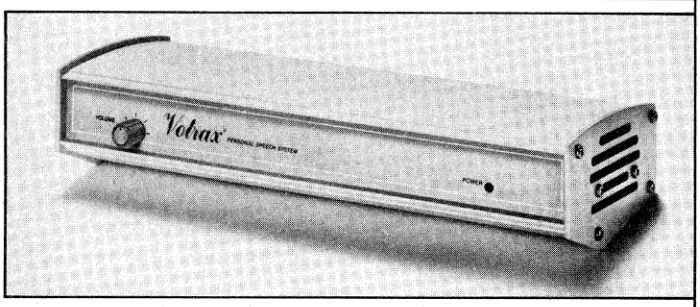
To compensate for some of the idiosyncracies of English or for specialized or technical vocabularies, users can define an exception-word table. This allows you to store programs for words and proper names whose spelling violates the rules incorporated in the unit.

The PS System is equipped with both serial and parallel interfaces and an input buffer of more than 3,500 characters, subdivisible for a printer buffer. User-programmable speech rate and amplitude give more natural rhythm and greater control over word emphasis.

Other features include an audible alarm, a chime-prompted mode, oral error prompting, X-on/X-off, and RTS/CTS handshaking. Experimenters can use a ROM expansion socket and Z80 software capabilities.

The synthesizer sells for $395 from Votrax, 500 Stephenson Highway, Troy, MI 48084, (800) 521-1350.

Reader Service ✓560



Votrax Synthesizer

Zaxxon Comes Home

Sega Enterprises' Zaxxon, one of the most popular arcade games of 1982, has been adapted by Datasoft for the Color Computer.

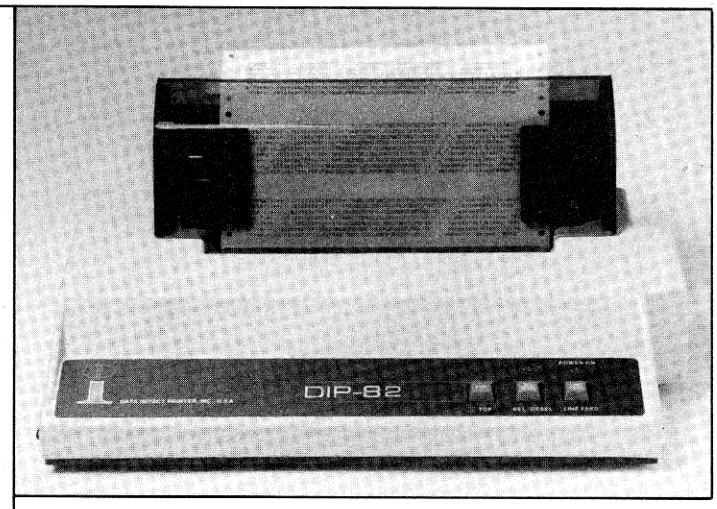
The vivid graphics display simulates aircraft flight, with your ship invading the floating enemy fortress. Navigating between laser barriers and fortress walls, you score by destroying missiles, ships, gunnery, and radar towers, heading toward a final confrontation with the enemy robot.

The game costs $39.95 on tape or disk from Datasoft, 9421 Winnetka Ave., Chatsworth, CA 91311, (213) 701-5161.

Reader Service ✓555

Versatile Dot-Matrix Printer

The D-82 F/T printer supports the full 96-character ASCII set at 40, 48, 66, 89, 96, or 132 characters on 8.5-inch paper. It features tractor or friction paper feed, 7 by 7 or expanded 14 by 7 matrix, 100-cps bidirectional printing, an 800-character buffer, and high-resolution, dot-addressable graphics.



Data Impact Printer

The user can specify six different character sizes and one- or two-pass printing under program control. All electronic components are mounted on a single printed circuit board and can be serviced without disassembling the printer. A Centronics-compatible parallel interface is standard; options include an RS-232C serial interface, 2K buffer, high-speed serial up to 9,600 baud, and single-sheet paper tray.

The D-82 F/T measures 17 by 9.75 by 6.5 inches. It sells for $595 from Data Impact Products Inc., 745 Atlantic Ave., Boston, MA 02111, (617) 482-4214.

Reader Service ✓550

Stock Market Spreadsheet

Stockvue is a spreadsheet program that lets stockbrokers and investors scan information, change variables, and calculate potential profit and risk on investments.

The display includes calculations of dividends, interest (margined trades), trade commissions (either full service or discount broker), and opening cost according to Securities and Exchange Commission rules on margin requirements. Users simply plug in information related to the opening trade, plus hypothetical figures for a closing date and a likely price on that date. Stockvue posts all the results, including the bottom-line net return on investment.

The $129.95 program is available on disk or cassette for the Model III from Star Value Software, 12218 Scribe Drive, Austin, TX 78759, (512) 837-5498.

Reader Service ✓583

Monster Maze

Monster Maze is a challenging graphics action game from Epyx/Automated Simulations.

Trapped in a web of blind alleys and seemingly endless halls, you must find gold bars and vitamins while over 40 mutant monsters try to find you. The vitamins give you strength to kill the monsters and escape with the gold. Be careful—you only have nine lives!

Screen graphics show the labyrinth from the wanderer's point of view. A map gives an overhead view, though monsters sneak up on those who look at it too long. Nine levels of play increase the challenge, and a new maze is created for each game.

Monster Maze is available on disk (32K) or cassette

DOES STRING COMPRESSION HAVE YOU TIED UP IN KNOTS?

LET TRASHMAN CLEAN UP THE MESS!

TRASHMAN is a machine language utility for the TRS-80 Models I and III. It was written by Glenn Tesler, the author of FASTER, and can reduce BASIC's string compression time by 95% (see table below).

WHAT'S STRING COMPRESSION?

When a BASIC program changes a string (words, names, descriptions), it moves it to a new place in memory, and leaves a hole in the old place. Eventually, all available memory gets used up and BASIC has to push the strings together to free up some space. This takes time. Lots of time. The computer stops running for seconds or minutes, and you may even think it's "crashed". The keyboard won't work, and until all the strings have been collected, you just have to sit and wait. Then things run for a while, until string compression is needed again. And again.

If you're using your computer for business, that wastes your money. If you're using it personally, it wastes your time.

WHAT'S THE SOLUTION?

As soon as you start using TRASHMAN, those delays almost disappear. It uses less than 600 bytes of memory, plus 2 bytes for each active string. It works with other machine language programs and with all major operating systems. It's easy to use, comes with complete instructions, and can be copied to your own disks.

WHAT'S THE CATCH?

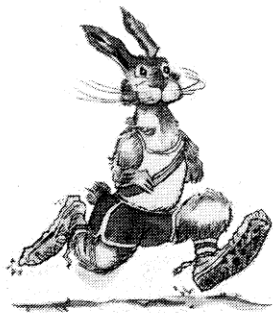
If a BASIC program uses only a few strings, very little time is wasted in string compression, and TRASHMAN won't be helpful. But, if hundreds of strings, including large string arrays, are used, TRASHMAN is just what you need.

# STRINGS	SECONDS DELAY NORMAL	SECONDS DELAY TRASHMAN	PERCENT IMPROVEMENT
250	11.8	0.7	94
500	45.8	1.6	96.5
1000	179.6	3.5	98
2000	713.2	7.8	98.9

TRASHMAN is available on disk for just **$39.95.**

(All timings done on TRS-80 Model I. Model III 15% faster, but pct. improvements identical. Listing of timing program available on request.)

SAVE TIME WITH FASTER



"FASTER" speeds up most TRS-80 BASIC programs by 20-50%. It's helped hundreds of satisfied people and it can help you. Detailed instructions make it easy to use. FASTER analyses your BASIC programs *while they run,* then displays a simple change, usually one line, that sequences program variables so the ROM will find them faster.

You can use FASTER to speed up programs you've bought, as well as programs of your own. Since it isn't a compiler, your BASIC programs can be read and changed afterwards. FASTER works on business programs, models, and games. The more complex your program, the better the results.

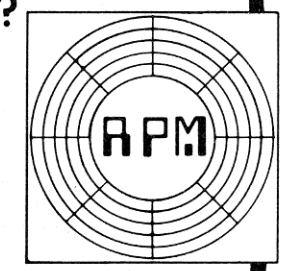
Does FASTER really work? Yes! Just check the reviews in *Personal Computing,* May, 1981, p. 116: **"FASTER is effective and easy to use"**; *80 U.S. Journal,* April, 1982, p. 106: **"I recommend FASTER to everyone"**; and *80 MICRO* (April, 1982, p. 40): **"If you...would like a significant increase in the run-time speed, then buy FASTER."**

FASTER runs on the TRS-80 Models I and III, 16-48K tape or disk, and all major operating systems. **$29.95**

"QUICK COMPRESS" takes only 276 bytes of memory, and removes the blanks and remarks from even the largest BASIC program in less than 3 seconds. It produces smaller, faster programs without altering their logic. **$19.95**

SPECIAL: FASTER and QUICK COMPRESS: **$39.95**

ERRATIC DISK DRIVES?



You can avoid unnecessary disk errors and repair bills by using **RPM.** This easy-to-use program measures the rotational speed and fluctuations of your disk drives, and warns you if they are running **too fast, too slow, or unevenly.**

Incorrect or erratic speed is a common cause of unexplained disk errors and loss of data. RPM's documentation explains how to **detect** *and* **correct** these problems quickly and easily. As *80 MICRO* (April, 1982, page 41) said: **"If your drives have problems I recommend RPM before paying to get it repaired."**

RPM is supplied on diskette for the TRS-80 Models I and III. We suggest you order a copy *before* you need it.

$24.95

ORDER FROM YOUR LOCAL SOFTWARE DEALER, OR CALL NOW, TOLL-FREE:

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CALIF: (800) 852-7777, Oper. 422
ALASKA/HAWAII: (800) 824-7919

FOR TECHNICAL INFORMATION CALL:
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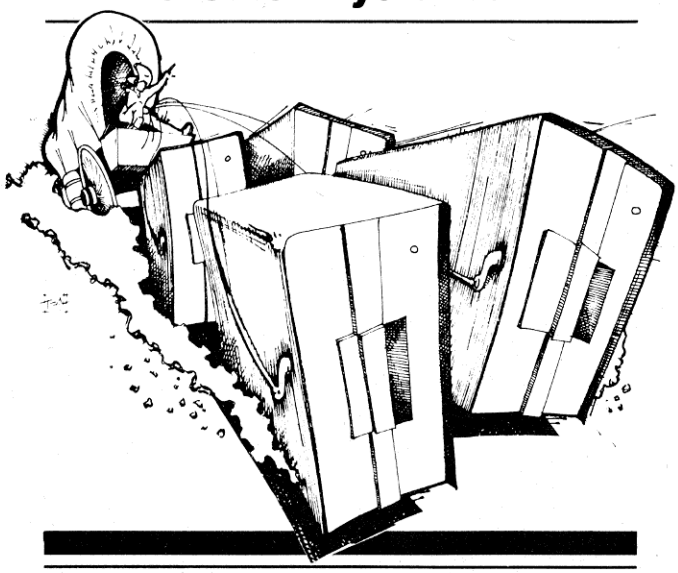
IT'S JUST GREAT

MACHINE LANGUAGE DISK I/O & Other Mysteries.



The most complete book on TRS-80 Model I and III disk I/O available!

Dateline: California, November 1982.

A hushed stillness held captive the hearts of thousands here as the news continued to spread of the impending arrival of a fantastic new book from the publishers at IJG.

Then, out of the West a cloud of dust could be seen on the horizon, coming fast . . .

Machine Language Disk I/O & Other Mysteries.

ON SALE NOW

270 pages of powerful information including the source code for a small disk operating system.

This book explains what the floppy disk system is all about, the Western Digital 1771 and 1793 Floppy Disk Controllers, what constitutes a disk file, how records are stored on disk, error processing, and TRSDOS error codes.

Plus a disk formatter program, a program to calculate the password for a given file, a full screen file editor, a complete smart terminal program and much, much more.

Harness the Power!

MACHINE LANGUAGE DISK I/O & Other Mysteries is available for $29.95 at computer stores, B. Dalton Booksellers and independent book dealers around the world. If your dealer does not carry IJG products, order direct.

Include $4.00 for shipping and handling. Foreign residents add $11.00 plus purchase price. U.S. funds only please.

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Upland, California 91786
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Helping You Help Yourself.

TM TRS-80 and TRSDOS Trademarks of TANDY Corp. © IJG, Inc. 1982

(16K Level II) for the Models I and III. Either version is $29.95 from Epyx/Automated Simulations Inc., 1043 Kiel Court, Sunnyvale, CA 94086, (408) 745-0700.

Reader Service ✓581

96K for Model I

Bigmem upgrades the Model I with 64K keyboard RAM, 48K available on power-up, with or without an expansion interface connected. With one, port switching the external memory from Level II Basic yields 80K RAM; by port command, 96K (minus 1.28K for video, keyboard, and input/output) is available for machine-language programs.

A board jumper will enable 2K RAM above ROM and ¾K RAM in keyboard address space. This protected memory is suitable for special machine-language routines such as printer driver, keyboard debounce, or line renumbering.

New 64K RAMs replace the old 16K chips in the keyboard unit; an internally mounted memory controller board provides the means for bank switching the expansion interface memory. Switching to the 64K mode either overlays the ROM with RAM or remaps the video, keyboard, and I/O to high memory for CP/M-compatible operation. The choice is determined by a second board jumper.

Installation involves cutting power-supply traces not used by the new single-voltage RAMs and soldering an internal cable that plugs into the controller board. The $180 kit includes eight 64K RAM chips, controller board, internal cable/connector, wire, solder, and detailed instruction manual.

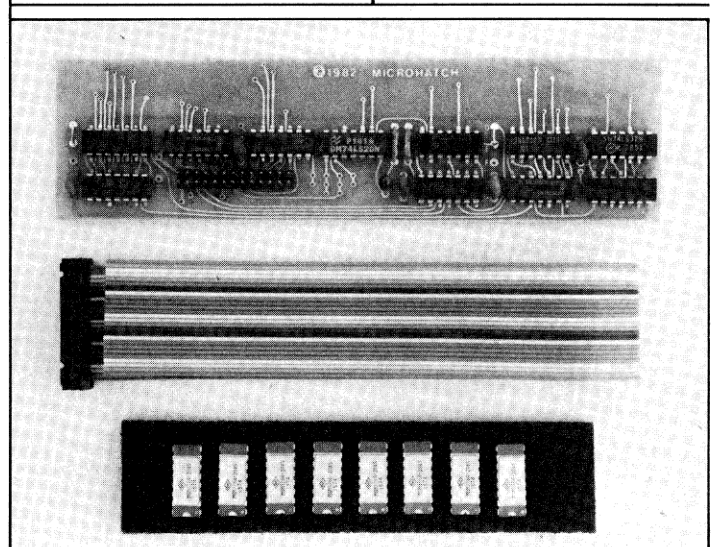
For more information, write Microhatch, P.O. Box 501, DeWitt, NY 13214, or call (315) 446-8031 after 6 p.m.

Reader Service ✓569

Cassette Stock Planner

Stoktrak is a tracking/planning program for the investor who spends money on stocks instead of disk drives.

Handling up to 30 stocks per data file, the program provides reports on current value and yield, unrealized capital gains for each stock, realized gains for any stock sold, and quarterly and annual dividend records. A



Model I Bigmem

32-page user's guide is included.

It operates on a Model I/III with 16K Level II RAM, cassette, and optional printer. Price is $24 from David H. Barrett c/o Microserve, 1304 Kent St., Durham, NC 27707.

Reader Service ✓575

Business Management Series

Century Software Systems has completed the first phase of its Business Management Series, seven professional decision-making tool packages for the Model II with CP/M or TRSDOS and at least 56K of memory.

Based on financial, statistical, econometric, and accounting theories, the series helps managers set policy for business, professional, or industrial companies. The programs, supplied with extensive documentation and examples, cover financial decisions ($345), lease-versus-purchase analysis ($295), statistical analysis ($320), real estate analysis ($395), econometrics ($310), financial-statement analysis ($345), and linear programming ($240).

A $50 demo disk displays sample runs from each package, and the seven manuals and demo disk are available for $350. The Business Management Series is produced by Century Software Systems, 1875 Century Park East, Suite 1730, Los Angeles, CA 90067, (213) 879-5911.

Reader Service ✓570

Educational CRT Table

The EC5, a CRT table for school and training use, offers a 2-by-3-foot work surface, 4-inch casters (two with locking brakes), and positive stops that eliminate shelf slippage.

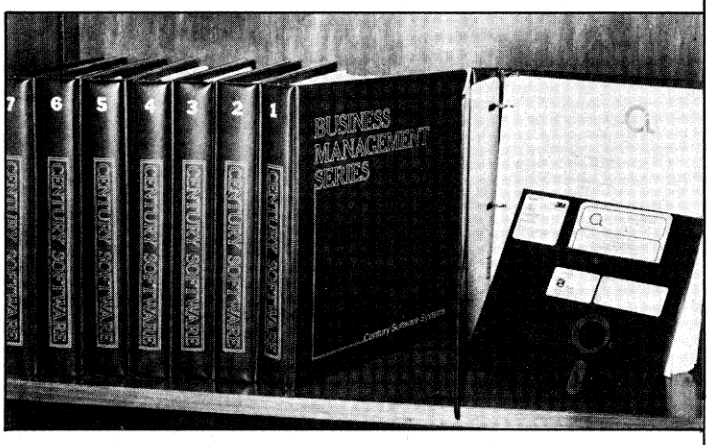
A cord organizer/modesty panel keeps cords and connectors off the floor and out of the way. The table's electrical supply unit features three outlets and a 20-foot cord with grounded plug.

The table weighs 58 pounds, ships via UPS, and is easily assembled with standard tools. For more information, contact Bretford Manufacturing, 9715 Soreng Ave., Schiller Park, IL 60176, (312) 678-2545.

Reader Service ✓571

CP/M Software Index

The third edition of Small Systems Group's CP/M Software Index lists 1,688 programs offered by 507 vendors, more than twice as many as the previous edition.



Model II Business Series

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The totally PORTABLE, totally COMPATIBLE, Model III in a Briefcase

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✓See List of Advertisers on Page 387

MODEL III HARD DRIVE
$1295.

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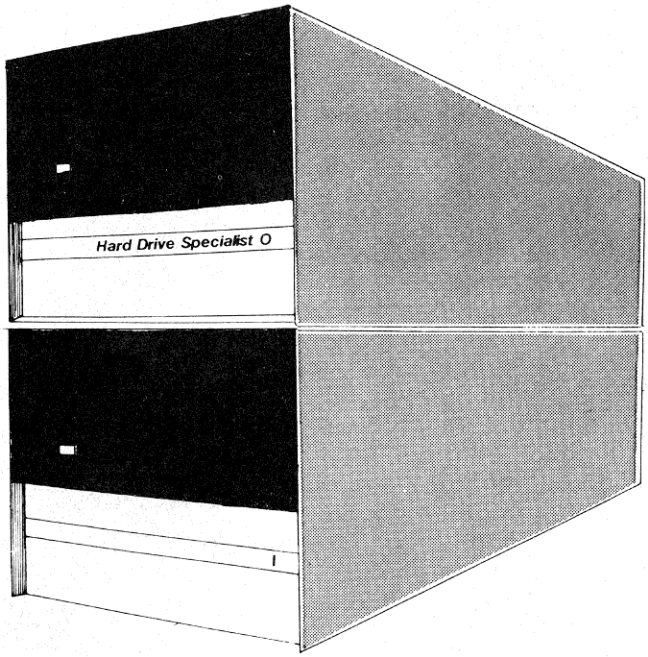

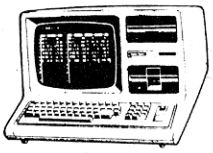

SECONDARY

It's no secret. We have a quantity contract to bring you the highest quality system at the lowest price available The combination of Tandon Disk Drives and Western Digitals error checking and correcting Hard Drive Controller Board create the back bone of the Hard Drive Specialist System. The balance of the interfacing is by one the oldest Engineering teams in the Model III/Hard Drive business These systems have been in testing since September of 1981 and have proven to be reliable and fault free .The first primary systems are available in a 5 meg version for $1295., a 10 meg for $1495., and a 15 meg for $1695.. The secondary or add on systems are available in a 5 meg version for $895., a 10 meg version for $1095., and a 15 meg for $1295. Model I primary version add $50.. All prices include our 120 day warranty and free shipping UPS ground. Compatible with DOSPLUS 4.0 and LDOS.

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455

Model III Drive Kits

We refuse to sell a low quality kit , because you don't need any problems. All of the Compukit drive kits contain Tandon disk drives, Astec switching power supply, factory brackets, a drive controller board that works with all Model III disk operating systems, 32K of memory, a manual that is easy and simple to use, and all of the hardware required. All that you supply is 2 screw drivers, 2 hours average time, and software.

Drive kit with one 40trk single sided drive $479.
Drive kit with two 40trk single sided drives $699.
Drive kit with two 40trk double sided drives $899.
Drive kit with one 40trk SS/&a 5meg hard drive system $1799.

Complete Model III Systems

48K one drive system $1495. 48K two drive system $1695.
48K with two double sided drives $1895.
48K one double sided floppy disk drive and one 5 meg hard drive $2895.
112K CP/M and Model III software compatible, with two disk drives and a 80 column green phosphor CRT $2699.

System options with free installation are a green phosphor CRT $89. a RS232c $89., DOSPLUS 3.4 $100., DOSPLUS 4.0 $200.

TANDON DISK DRIVES

ask for a FREE copy of DR. Roberts Disk Drive Manual with any drive purchase
TM100-1 40trk Single Sided/Double Density $199.
TM100-2 40trk Double Sided/Double Density $299.
one drive case and power supply $49.95 2 drive cable $24.95

Model II Disk Bays

Model 16 Disk Bays

these bays consist of the TANDON slim line drives as used in the Model 16, case and power supply, and all the cables required.

one single sided drive bay $699.
two single sided drive bay $1099.

one double sided drive bay $799.
two double sided drive bay $1299.

Model III RS232c Kit $89.

Green phosphor CRT Kit $89.
for your Model I, II, or III

COMPUKIT DOCTOR $29.95 by Jim Penny

System diagnostic for disk based Model III's.
If your not sure if your Model III is working correctly Compukit Doctor will check ROM, RAM, Keyboard, and Disk Drives. This fast machine program leads you through it with documentation built into the program. $10.00 off on this program with any purchase on this page.

COMPUKIT

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DOSPLUS 3.4 $125. Newscript 7.0 w/labels $110.
C.Itoh 8510 $519. F10 $1449. 1550 $749.
Epson MX-80 $499. MX80f/t $559. MX100 $727.
Okidata 82A $459. 83A $727.
Verbatim SS/DD Box of 10 $25.95

FREE SHIPPING UPS GROUND 120 DAY WARRANTY

We accept Visa, Mastercard, bank checks, money orders, personal checks are held 1-3 weeks, and COD

✓See List of Advertisers on Page 387

The index is organized into five major areas: systems programs, general applications, accounting, utility applications, and industry-specific software. These areas are broken down into 89 categories, ranging from data management and higher-level language processors to dairy and cattle programs and sports. Each entry gives a program description, price, vendor's address and phone, and operating-system versions.

Single copies are $10 (California residents add 6 percent tax) from Small Systems Group, Box 5429, Santa Monica, CA 90405, (213) 392-1234.

Reader Service ✓557

Head Cleaner Disk

Cleaning your drive heads can increase their life, prevent read/write errors and head crashes, and provide a clearer screen. The Verfin dry nonchemical head cleaner disk removes oxide, smoke, and oil particles, and is safer than liquids or wet-process disks.

To clean the head, simply insert the Verfin disk as you would any other and engage the drive for 20 seconds. The disk's nonabrasive soft polyester material absorbs contaminants.

Two disks ($24.95) can be used for 30 cleanings with single-sided or 15 cleanings with double-sided drives. They are available in 5¼- or 8-inch sizes from Zolman International Inc., 600 Montgomery St., 45th Floor, San Francisco, CA 94111, (415) 421-5340.

Reader Service ✓566

Watt-Watching Software

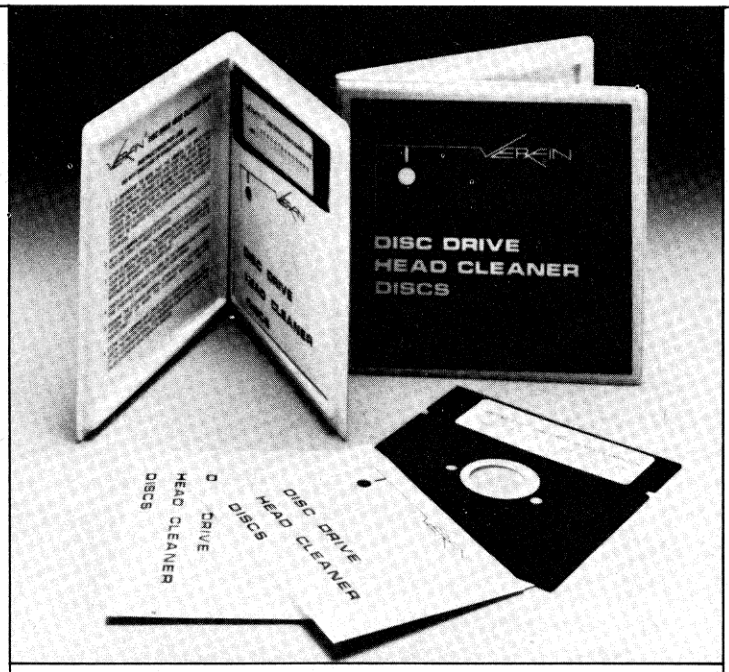
Energy Monitor is a software system that organizes data on energy units, expenditures, and energy use relative to climactic variables. It can handle from one to 90 independent buildings.

The program produces a set of six reporting formats. Each report illustrates energy use and documents conservation activity by fuel type at each building and for the system as a whole.

Managers can use reports to identify and set energy conservation goals and objectives, prepare energy budgets, verify invoices for billing and fuel delivery, and review the performance of energy-saving investments. Energy Monitor can also be used to compare the energy efficiency of various buildings within a system.

The program is available on disk for the 48K Model III. Its price is $245 from Addison-Wesley Publishing Co., Computer Software and Applications, Reading, MA 01867, (617) 944-3700.

Reader Service ✓580



Verfin Cleaner Disks

Match Game

The Match Game is a memory-testing program that can be adapted to an unlimited variety of educational materials. It is suitable for home or school use by children of all ages.

The computer presents a game board of numbered boxes. Players uncover two boxes on each turn, trying to find those with matching contents. The game can be played with exact word matches, paired word matches (such as synonyms), math problems and answers, or pairs assigned in your own games.

One to four people can play on any of five game board sizes. The computer can take the role of one player, adjusting its level to the other players' skills.

The game is available on Model I and III cassette ($24.95) or disk ($29.95) from Teaching Tools Microcomputer Services, P.O. Box 50065, Palo Alto, CA 94303, (415) 493-3477.

Reader Service ✓576

Multiport

The Multiport expansion unit for the Color Computer allows simultaneous connection of up to four peripherals. The computer can switch between peripherals under software control, allowing one program to access any or all of them at any time. A disk drive, modem, program cartridge, and printer, for example, can now be on-line at once.

The unit allows selection of any of the four sockets with a simple POKE command. It connects directly to the expansion port of all Color Computer models.

Price is $99.50 with full instructions. For more information, write Maple Leaf Systems, P.O. Box 2190, Station C, Downsview, Ontario, Canada M2N 2S9.

Reader Service ✓579

Data and Text Manager for Color Computer

Homebase for Color Computer disk owners is an integrated system that provides a data-base manager, spreadsheet, and text processor in one menu-driven package. The $75 program also includes utilities for copying, merging, and synchronizing files and summarizing amount data fields.

The data manager lets you define up to 250 records in 49 data fields; add, change, and delete records and fields or move records within the file; and sort, sum, and reorder data. The text processor allocates up to 250 screens of text, letting you add, change, and delete files and edit with insert, delete, duplicate, move, and search and replace commands and four-direction cursor control.

Radio Shack or Epson printer owners can print all or selected records or data fields, with automatic formatting of dates, time of day, phone numbers, and dollar amounts. Users printing text can define left and right margins, line spacing,

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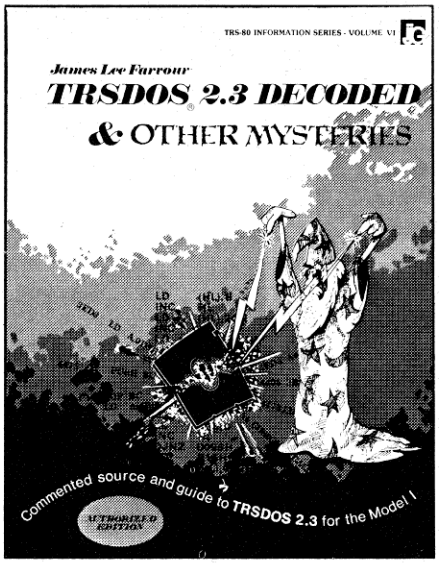
a fully commented source code listing at the end of each chapter along with (where appropriate) diagrams and descriptions of the data structures for the modules described, a discussion of the Model I system architecture as it pertains to operating system implementation, a general description of the Z-80 CPU register sets and interrupt modes, a description of the command line interpreter and the subroutines used by the TRSDOS commands module, the modules used by the file management system, the error message processor, the debug module available with TRSDOS, and much, much more.



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and six horizontal tabs, with standard, compressed, double-width, or emphasized characters.

Homebase requires 32K Extended Color Basic and one disk drive. For more information, contact Homebase Computer Systems, P.O. Box 3448, Durham, NC 27702, (919) 544-5408.

Reader Service ✓573

Model III Disk Upgrade

The Micro-Design MDX Upgrade for the Model III includes an MDX-6 floppy-disk controller board, an installation kit with all required hardware for mounting two internal disk drives, and one 40-track TEC disk drive.

The MDX-6 controller board features a state-of-the-art LSI device designed specifically for read/clock recovery separation. All data and control lines from the CPU are buffered to assure accurate data levels to the 1793 controller chip. The board will control up to two internal and two external single- or double-density disk drives, and is compatible with all Model III DOSes.

The accompanying hardware includes a linear power supply, gold alodine aluminum mounting towers, and all required cables for installing both internal drives. The TEC drive has a track-to-track access time of 5 ms and is rated for both single- and double-density operation.

Installation requires a screwdriver and about one hour. The Upgrade is priced at $399, with additional TEC disk drives available for $219.95, from Micro-Design, 6301 Manchaca Road, Suite J, Austin, TX 78745, (800) 532-5001.

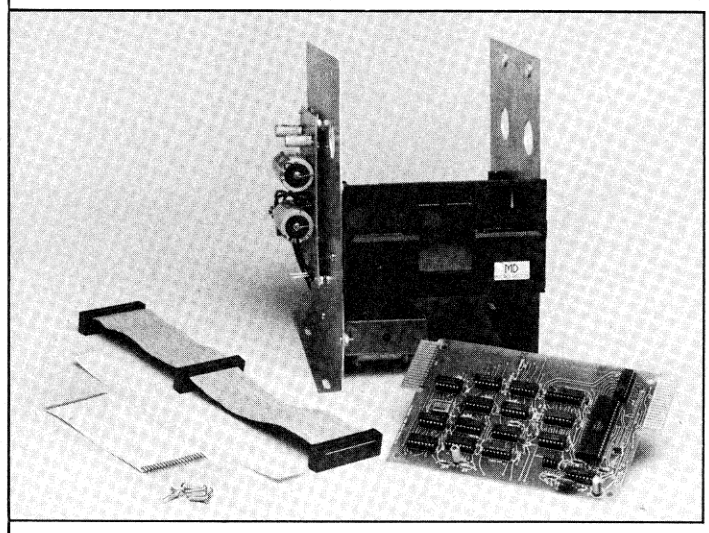
Reader Service ✓565

Hard Disks, Printers From Radio Shack

Radio Shack's winter line-up of peripherals includes two new printers and hard disks for the Model I/III.

The DMP-400 ($1,195) is a 132-column dot-matrix printer that produces 140 cps at 10 characters per inch and supports proportional space, backspace, boldface, underline, and super- and subscripts. The DWP-410 daisy-wheel printer ($1,495) allows 10 or 12 cpi and proportional spacing, and prints over 300 words per minute.

For $2,495, Model III users can add a five-mega-



Model III Disk Kit

byte Winchester drive with the LDOS operating system; up to three more drives ($1,995 each) can bring your TRS-80's total to 20 megabytes. Model I owners must buy a $39.95 hard-disk adapter package.

Other new Tandy products are a Model III business graphics analysis package for pie, bar, line, and scatter charts ($174.95), 48K Super-Scripsit for the two-disk Model I and one-disk Model III ($199), and a Color Computer game based on the recent movie *Poltergeist* ($34.95).

All are available at Radio Shack Computer Centers nationwide.

Reader Service ✓559

Smart Terminal Program

Colorcom/E is a smart terminal program on plug-in ROM cartridge for the Color Computer. It supports on-line and off-line scrolling, off-line printing of data, receiving and sending cassette files, and full and half duplex, and works with any serial printer. An optional word mode eliminates word-wrap. Data can be easily edited before printing or writing to cassette.

The program sells for $49.95 from Spectrum Projects, 93-15 86 Drive, Woodhaven, NY 11421, (212) 441-2807.

Reader Service ✓577

Color Quartet

The Composer, a menu-driven music compiler for the Color Computer, allows you to write music using four separate voices over a seven-octave range. Key and tempo may be specified and changed as music is played.

The screen displays a colored kaleidoscope pattern and the number of the note being played. The latter helps in debugging music. Compiled music is saved as an independent machine-language subroutine, so that music and sound effects can be integrated into other Basic programs.

The Composer requires Extended Basic for cassette ($24.95) or disk ($29.95). It can be ordered from Speech Systems, 38 W. 255 Deerpath Road, Batavia, IL 60510, (312) 879-6880.

Reader Service ✓572

Duplicate Your Tapes

Copy-Tape is a menu-driven utility that makes back-up copies of Basic or machine-language tapes on the 16K Model I or III. It displays the ASCII code of the program during loading and recording, and also verifies and advances tapes. On the Model III, Copy-Tape also converts 500 baud to 1,500 baud and vice versa.

The guaranteed cassette sells for $9.95 plus $2 postage from Modtec, Software Division, 4144 N. Via Villas, Tucson, AZ 85719, (602) 293-5186.

Reader Service ✓567

The Amazing Ben

The Amazing Ben is the first in a series of program sets designed to introduce programmers of all ages to the concepts of artificial intelligence. Using your knowledge of Basic, the set teaches you to write programs in Ben's language, allowing him to make decisions, evaluate different paths, and record data as he explores a sequence of increasingly difficult mazes.

The process involves examining your own thought processes while giving Ben rules for acquiring knowledge, and handling the computer as a symbol processor rather than a calculating device. The focus is not only on

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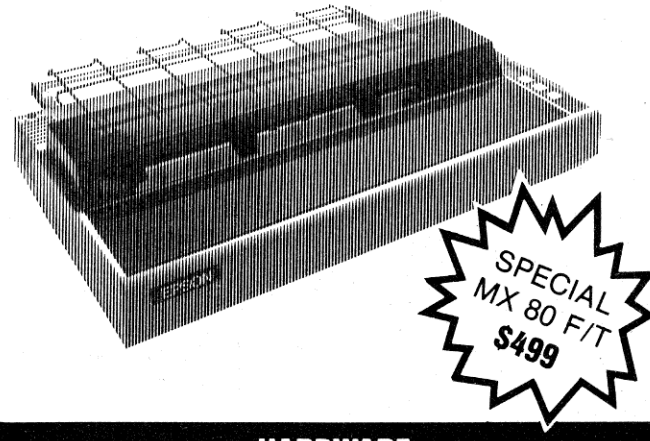

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what Ben learns, but how he learns it.

Priced at $79.95, the program set is offered on 32K disk for the Model I/III. A Color Computer version might appear in the future, as will additional sets such as Elementary, My Dear Ben and Ben On the Asteroid.

For more information, contact Krell Software Corp., 1320 Stony Brook Road, Stony Brook, NY 11790, (516) 751-5139.

Reader Service ✓561

The Arranger

The Arranger is a fast machine-code program that automates and catalogs your disk library. The double-density Arranger disk stores the directories of up to 250 disks, 45 programs per disk, and lets you alphabetize all or part of your library file in a few seconds.

If you have changed one of your disks, you can update the library with one keystroke. During this update, the Arranger records DOS type, density, free grans, number of tracks, system or data, date updated, and current visible file names. A back-up function is built in.

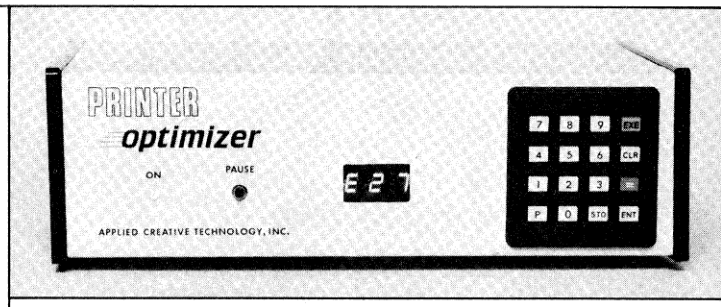
The program works with the Models I or III with all popular DOSes and one to four disk drives, whether 35, 40, or 80 tracks. Its price is $29.95 from Triple-D Software, P.O. Box 642, Layton, UT 84041, (801) 456-2833.

Reader Service ✓582

Printer Optimizer

The Printer Optimizer is an independent Z80-based spooler with its own power supply. It absorbs data from your computer at full speed and then sends it to a printer or modem, freeing the computer for other work.

A keypad and display let you program the unit to convert characters on a one-to-one, many-to-one, or one-to-many basis, or ignore characters that confuse your printer. Users can record new printers' command sequences for different type fonts and sizes, page formatting, and so on, and then access a different mode by simply pushing a button.



Printer Optimizer

The Printer Optimizer also handles bidirectional RS-232 data transmission, data compression, and temporary halts in printing. It sells for $495. A plug-in serial RS-232 card or additional 64K memory cards are $125 each.

For more information, contact Applied Creative Technology Inc., 2723 Avenue E East, Suite 717, Arlington, TX 76011, (800) 433-5373.

Reader Service ✓552

InfoScan

InfoScan is a menu-driven facility that lets the nontechnical user format, store, retrieve, and display information.

Data entry is totally free form, and does not require any complex specifying of fields. Up to 450 records are stored on disk, along with a user-specified key that describes the record. The keys can be sorted in any sequence, reviewed in sequence, changed, or deleted easily. Disk space allocation and management are automatic.

The machine-language program runs on the 48K Model I or III with one disk drive. It sells for $49.95 from The Smallsystem Center, P.O. Box 268, New Hartford, CT 06057, (203) 482-3689.

Reader Service ✓556

Color Computer Joystick

Endicott Software has introduced an affordable, reliable joystick for the Color Computer. Hand-assembled and checked for durable service, the unit features smooth function for excellent cursor or game character control. A 90-day parts and labor warranty is included.

The joysticks sell for $18.95 each or two for $35.95, plus $2 apiece for shipping. For more information, contact Endicott Software, P.O. Box 12543, Huntsville, AL 35802, (205) 881-0506.

Reader Service ✓578

2,400-Baud Modem

A direct replacement for Bell 201B data sets, the MT201B modem provides 2,400-baud, full-duplex operation over four-wire leased lines, or half duplex over two-wire lines. The modem uses phase-shift modulation and synchronous data format, and communicates with other 201B- and 201C-compatible modems.

A stand-alone unit sells for $685 from Multi-Tech Systems Inc., 82 Second Ave. S.E., New Brighton, MN 55112, (612) 631-3550.

Reader Service ✓562

Mac Inker

Mac Inker is a device that automatically reinks ribbons for any printer, nearly eliminating ribbon replacement costs.

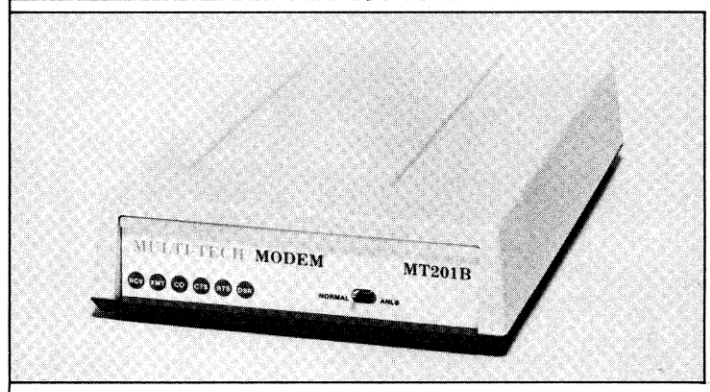
Once you load the cartridge and press the start button, Mac Inker meters and distributes the correct amount of ink across the ribbon. Printing stays crisp and legible, and ribbon life is extended almost indefinitely.

Different ink colors and cartridge loading stations for any current printer are available. Price is $54.95 from Computer Friends, 100 NW 86th Ave., Portland, OR 97229, (503) 297-2321.

Reader Service ✓574

Softrol for Recorders

The solid-state Softrol cassette-recorder controller



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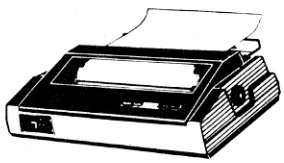

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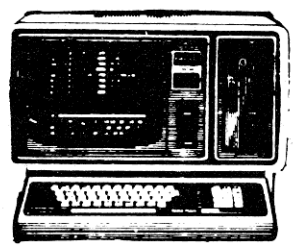

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plugs between the computer and any standard-plug recorder, regardless of motor polarity.

The "soft" switch allows pushbutton positioning of tape to start of program without plug pulling, reduces switching noise that can cause "switch hits" on programs, and protects CPU relay contacts from possible early failure. A motor-off delay of about one second eliminates "pinch hits" on the ends of programs caused by capstan/pinch-roller pressure; the delay also automatically puts short silent gaps following Saves for easier location of program starts.

Softrol can also be used to computer-switch any other DC load of from five to 15 volts and up to 1.5 amps, with or without the delay-off feature. It is available for $18.99 from Lemons Tech Services, P.O. Box 0429, Buffalo, MO 65622, (417) 345-7643.

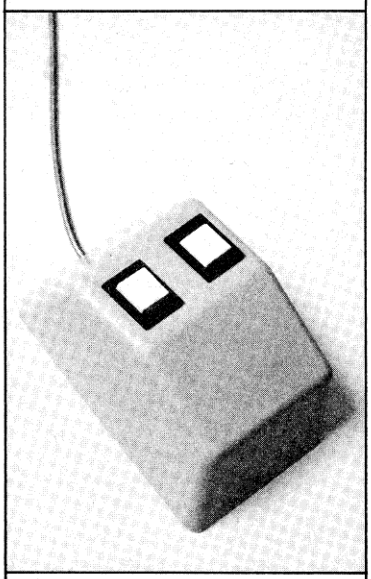
Reader Service ✓554

Softrol

Eeeek! A Mouse!

Micro owners with a flair for tinkering can now put a new input device beside their joystick and light pen—a mouse.

The 3G Micromouse is a pointing device that moves the screen cursor as it is moved on the desk or table top, allowing the same eye-hand coordination used in writing to direct cursor location. Buttons on the unit's top give commands, such as marking the beginning and end of a line in graphics work or deleting a letter in word processing.



Micromouse

The mouse is still primarily an OEM product, but 3G says that the work of rigging a TRS-80 interface is fairly simple—with one integrated circuit and a few transistors, the mouse's tail is hooked up to the cassette port.

The device sells for $180. More information is available from 3G Company Inc., Route 3 Box 28A, Gaston, OR 97119, (503) 662-4492.

Reader Service ✓568

Food Co-Op Software

FC/M (Food Co-Op Management System) is a software package for church, civic, educational, or other groups that simplifies the organization and management of co-operatives.

The documentation ($35) gives complete instructions for the setup and operation of a co-op for any size group, and shows you how to write your own program to keep track of the co-op's activities. The complete system includes the FC/M program in Cobol and the Radio Shack Cobol runtime package.

Price is $150 (Model I/III, 5¼-inch disk) or $200 (Model II, 8-inch). Purchase of documentation is credited to purchase of the system.

For more information, write Barstrann Corp., P.O. Box 265, Mid City Station, Dayton, OH 45402.

Reader Service ✓558

Disk Controller Boards

Micro Mainframe (2227 McGregor Ave., Rancho Cordova, CA 95670, (916) 635-3997) offers two floppy-disk controller boards with upgrade kits for the Model III.

The FDC-3B ($79.95) will run 5¼-inch drives in both single- and double-density

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STANDARD FEATURES INCLUDE
1. Underlining either by word or create lined paper.
2. Mix WIDE and regular sizes MID-LINE.
3. Graphic INVERSION of any part of the text.
4. Short line LOGIC SEEKING for increased throughput.
5. Reversed Block Capitals Character Set.
6. FONTMAKER - A 12K. machine language program which enables you to create your own custom fonts.
7. Repeat printing capability without carriage advance even on graphic lines enables really crisp printing.
8. Create multiple HI-RES mail labels with ease.
9. Three and 1/2 character sets possible in every font.
10. Variable Linespacing control for text documents.
11. Bit Masking like you [illegible] see here.
12. Create any type or style of characters desired.
13. Proportionalize the screen graphics to any size.
14. Create Graphics that have fancy designs in them.
15. Character sets may contain letters up to 40H x 128W.
16. Continuous WIDE printing in any font or style.

ORDERING INFORMATION
CRAYON - Disk/Cass MOD 1/3 $45 DISK / $35 CASS
CRAYON DELUXE - DISK ONLY MOD 1/3 $80.00
UPDATE - $35.00 To previous owners only.

Consider carefully before you buy any character set generation program. CRAYON DELUXE is the most advanced Graphic/Text editor ever written for the TRS-80. See our previous ads for a description of CRAYONS many outstanding standard features. Add to this CRAYON DELUXE's character font generation capabilities and machine language speed and you will see why it is the BEST editor of its kind. Don't sell yourself short.

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LIBERAL DEALER TERMS AVAILABLE - INQUIRIES INVITED

NEW PRODUCTS

modes. The FDC-3C ($99.95) will also run drives with both single- and double-headed configurations, and allows operation of 8-inch single- and double-density disks using DOSPLUS 3.4/4.0 software.

An installation kit with all cables, brackets, and screws for either is $39.95. A complete upgrade package containing the controller board, installation kit, power supply, and a TEC 40-track drive is available for $349 (FDC-3B) or $369 (FDC-3C).

Reader Service ✓551

Model II Security

The Locker is a simple, effective, and reversible software extension that protects Model II programs against unauthorized modification or plagiarism, without hardware modifications or complex encryption.

The extension modifies the standard TRSDOS 2.0 operating system and Basic. It requires no additional RAM, disk space, Assembly-language coding, or user calls, and is permanent even through back-up. Your Basic program is not modified in any way; the only visible result is that List and LLIST will not work.

Price is $24.95 from The Management, P.O. Box T, Aledo, TX 76008.

Reader Service ✓553

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro *has not tested or reviewed these products and cannot guarantee any claims.*

DIFFERENT TRACK

A pair of two-dimensional products to introduce this occasional spotlight on unusual or novel items:

Bumperware 1.0 is an adhesive piece of white vinyl with the message "i'd rather be programming" (supports lowercase only) printed on it in red. "Written in the high-level language English," according to the manufacturer (Opcode Software, 1909½ Vine St., Berkeley, CA 94709), Bumperware is hardware compatible with most automobiles, offices, and programming environments. It is priced at $N+1 for quantity N, including tax and postage.

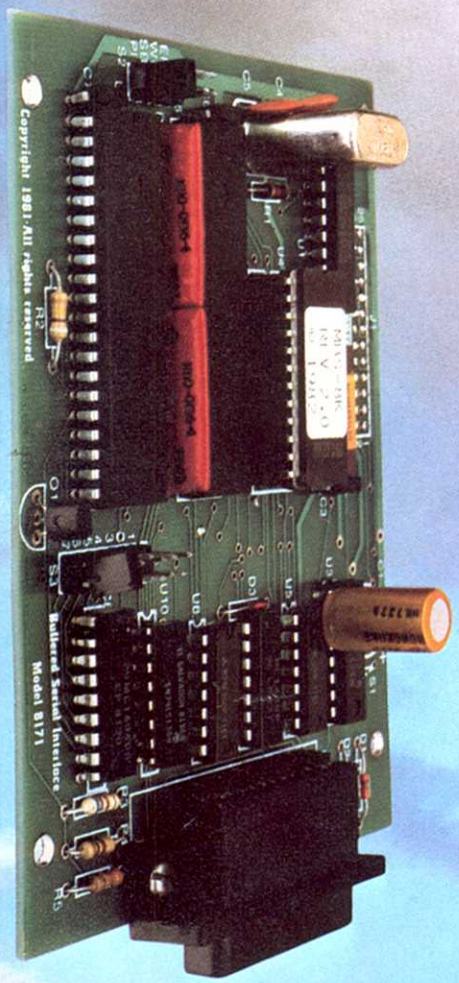
The Portable Keyboard is a laminated, 8½ by 11-inch reproduction of a computer keyboard (the TRS-80 is one of many models available), designed for the novice typist or the experienced one who wants to learn the position of special keys. Each key function is explained, so that the user can practice fingering without need of a computer or manual.

The keyboard costs $9.95 or two for $18 from Computer Practice Keyboard Co., 616 9th St., Union City, NJ 07087.

Reader Service ✓563, 564

January's New Products section gave the wrong area code for Printer Graphist Ltd., makers of a dot-addressable graphics software package. The mailing address is P.O. Box 603, Newport, VT 05855, but the phone is Quebec number (819) 564-7704.

HOW TO USE YOUR EPSON WITHOUT WASTING COMPUTER TIME:



Your computer is capable of sending data at thousands of characters per second but the Epson can only print 80 characters per second.

This means your computer is forced to wait for the printer to finish one line before it can send the next. A waste of valuable time.

THE NEW MICROBUFFER™ ACCEPTS DATA AS FAST AS YOUR COMPUTER CAN SEND IT.

Microbuffer stores the data in its own memory buffer and then takes control of the printer. This frees your computer for more productive functions.

PARALLEL OR SERIAL.

Microbuffer model MBP-16K is a Centronics-compatible parallel interface with 16,384 bytes of on-board RAM for data buffering.

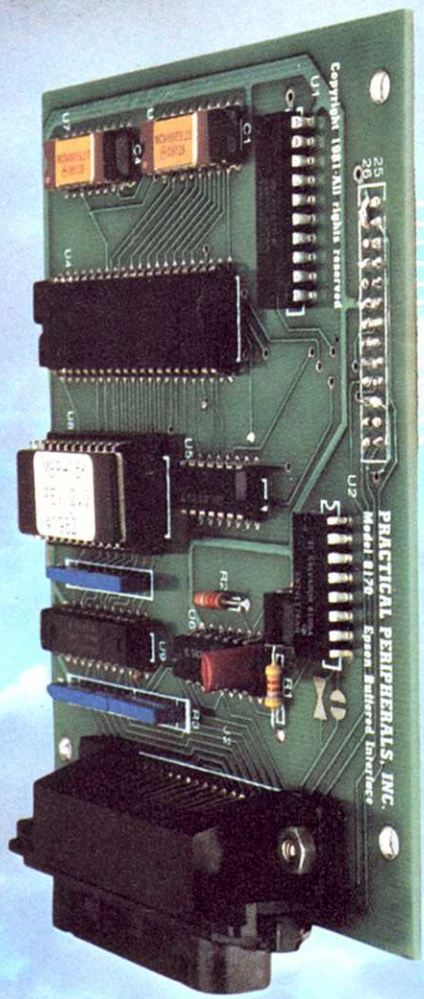
The MBS-8K is a full-featured RS-232C serial interface with both hardware and software (X-On/X-Off) handshaking, baud rates from 300 to 19,000 and an 8,192 byte RAM buffer.

SIMPLY PLUG IT IN.

Either model fits the existing auxiliary interface connector inside the Epson MX-80, MX-80 F/T or MX-100 without modification, and is compatible with standard Epson cables and printer control software, including GRAFTRAX-80.

JUST $159.00*

When you think how much time Microbuffer will save, can you afford *not* to have one? Call us for your nearest dealer.



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✓11

*Suggested retail price for either model.

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Communication Utility
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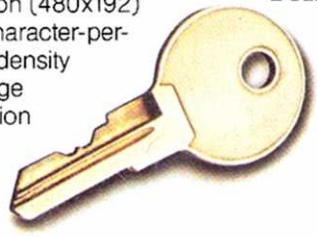
General Ledger
Mailing List
Macro Assembler
Education

TRSDOS*

CP/M**

Open your doors to a world of SOFTWARE with LNW computers. You'll get **MORE PERFORMANCE**[1] than with the IBM PC[2] the Apple II[3] TRS80 MODEL II or TRS80 MODEL III[4] along with software support of TRSDOS or CP/M, the TWO MOST WIDELY USED OPERATING SYSTEMS. This means you, the user, can select from the largest base of business or personal software.

Standard Features: A serial RS232 communication port, parallel printer port, Hi-Resolution (480x192) B/W and COLOR graphics, an 80 character-per-line screen display along with Quad-density interface for 5" or 8" floppy disk storage offering immediate access to 3.5 million characters, or optional Hard disk interface to 5 or 10 million characters.



Standard Software: LNWBASIC and DOS PLUS operating system packages, commanding all the above features, are included.

The LNW computer will be the key to your success with the starting price at **$1695.00,** along with a full 6 month warranty.

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**CP/M is a trademark of Digital Research Corp.
1. Performance is based on bench mark test in the JAN 1982 issue of BYTE magazine, pg. 54, with LNW80 II as the comparison.
2. IBM PC is a trademark of IBM CORP
3. APPLE II is a trademark of APPLE COMPUTERS.
4. TRS80 is a trademark of Tandy Corp.

International orders please inquire for pricing/shipping cost.